Cigarette Smoking, Social Support, and Workplace Smoke-free Policies among an Urban American Indian Population

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Dedication

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Abstract

Background: Despite a high prevalence of cigarette smoking and smoking-related morbidity and mortality among U.S. American Indians (AI), few studies have investigated tailored community and workplace interventions, including cessation programs. The purpose of this study was to determine the association of (1) the presence of a workplace smoke-free policy and (2) perceived social support among family and friends for quitting smoking with current smoking in a representative sample of urban AI adults. *Methods:* Data collected using respondent-driven sampling (RDS) from the 2011 Tribal Tobacco Use Prevalence Study was used to analyze the risk of being a current smoker when exposed to (1) workplace smoke-free policies and (2) perceived social support using two log multinomial regression models, adjusted for potential confounders based upon exposure-specific Directed Acyclic Graphs. Study-eligible participants were: self-identified AI, aged 18+, and residents of Hennepin or Ramsey Counties, Minnesota with a separate residence from the recruiter. Data were weighted to account for variation in participant network size using RDS Analysis Tool, V. 5.6., and participant demographics using U.S. Census 2010, yielding 940 of 964 completed interviews with full demographics. *Results:* Lack of a workplace smoke-free policy was associated with a 36 percent increase in risk of being a current smoker (PR = 1.36, 95% CI = 1.29 to 1.42) compared to a former smoker and a 41 percent decrease in risk of being a former smoker (PR = 0.59, 95% CI = 0.55 to 0.64) compared to a nonsmoker. Additionally, exposure to quite a bit or a lot of social support for quitting or staying smoke-free was associated with an 11 percent decrease in the risk of being a current smoker (PR = 0.89, 95% CI = 0.86 to 0.91) and an eight percent decrease in risk of being a former smoker (PR = 0.92, 95% CI = 0.88 to 0.95) compared to being a nonsmoker, respectively. There was also an eight percent decrease in risk of being a current smoker (PR = 0.92, 95% CI = 0.90 to 0.94) compared to a former smoker with exposure to quite a bit or a lot of social support for quitting or staying smoke-free versus no social support. *Conclusions:* Further study of Minnesota AI work environments and strategies for encouraging employers to

implement and enforce complete smoking bans is warranted. AI smoking cessation programs may benefit from inclusion of family and friend support mechanisms.

Keywords: American Indian, cigarette smoking, workplace smoke-free policy, social support, respondent-driven sampling, reality-based research

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Dissertation Organization

The organization of this dissertation provides an initial introductory chapter with background and literature review, a research design and methods chapter, two individual manuscripts, a results chapter, a discussion chapter, the conclusion, and tables and figures referenced within the dissertation. Following the bibliography, the appendix includes a technical report on respondent-driven sampling and a copy of the American Indian Adult Tobacco Survey questionnaire. Since the two individual manuscripts are in preparation for peer-review, there may be some redundancy in material.

Chapter 1: Introduction, Background and Literature Review

Smoking is a critical issue for Minnesota's sizable American Indian population. In 2010, Minnesota had 101,900 residents (1.9%) who identified themselves as American Indian alone or in combination with another race [1-2]. Approximately 30% of Minnesota American Indians lived in or around the 11 federally recognized Ojibwe (Chippewa) and Dakota/Lakota/Nakota (Sioux) tribes and another 30% lived in Hennepin and Ramsey counties which include the urban cities of Minneapolis-St. Paul [1-2]. In 2010, Minnesota American Indians experienced some of the worst health disparities relative to all other racial and ethnic groups including high rates of cigarette smoking (59%) (compared to 19% overall in Minnesota) and smoking-related morbidity and mortality (lung and bronchus cancer, other cancers, diabetes, heart disease, stroke, and chronic lower respiratory disease) [3-7]. In order to address this health crisis, it is important to gather baseline tobacco use survey data as reported in this paper to understand sociocultural, demographic, and environmental risk factors for current cigarette smoking and develop culturally appropriate public health and policy interventions such as tailored cessation programs and social support for quitting.

Cigarette smoking is well established as the leading cause of lung cancer in the United States (127,000 deaths or 78% of all lung cancers), and smoking contributes to significant morbidity and mortality due to other respiratory illnesses, cardiovascular diseases, and cancers (8.6 million affected and total 480,000 deaths/year) [8]. National trends indicate that cigarette smoking is declining. In the United States and Minnesota adult smoking prevalence decreased from 19.4% and 16.0%, respectively in 2010 to 17.3% and 14.4%, respectively in 2014 [3]. Among U.S. adults employed in the labor force, smoking decreased from 27.8% during 1987-1994 to 19.6% during 2004-2010, corresponding to roughly 30 million Americans. Despite the marked improvements, these estimates reveal the population has not achieved the 12% or less prevalence set forth by Healthy People 2010 and 2020 Objective TU-1.1 [9].

The Centers for Disease Control and Prevention estimates smoking-attributable productivity losses and medical expenditures at approximately $3,400 per year for each

adult smoker [10]. In addition, a number of studies have found 20-50% higher employer cost burden for smokers compared to never smokers, including an estimated 1% productivity loss due to smoking breaks and $75 billion in healthcare costs, life insurance, illness days, early disability, and workers' compensation [11-13]. This may be even more salient for American Indians who have some of the worst health disparities of all race/ethnicities including a high prevalence of recreational (non-ceremonial or sacred use) smoking—U.S. (23-60%) [14-20] and Minnesota (59%) [4-5]. Additionally, nearly half of Minnesota American Indians ages 16 and older in the U.S. civilian labor force work in blue-collar and service industries [21]. Employees in these industries have higher rates of cigarette smoking, secondhand smoke exposure, and other carcinogenic exposures (i.e., chemical and radioactive compounds) that may have synergistic adverse health effects [22].

Studies show that comprehensive smoke-free policies are more effective than other workforce interventions at reducing population level smoking irrespective of socioeconomic status or race and ethnicity [23]. Therefore, comprehensive smoke-free policies are a promising strategy to reduce smoking and smoking-related health disparities in the American Indian population.

In 2007, Minnesota passed the Freedom to Breathe Act (*Minnesota Statute* 144.411 to 144.417), which prohibits smoking in virtually all indoor workplaces including bars and restaurants. Exceptions to this law include outdoor locations, vehicles, independently owned residences, and sovereign tribal lands. American Indians may be more likely to work on reservations and other tribally owned lands, and other locations where the Freedom to Breathe Act does not apply. Only one published study was identified by this author to have assessed workplace smoking policies in a sample of Midwestern American Indians. Findings revealed two in five participants did not have complete workplace smoke-free policies [24]. Specific work environments and the presence of smoke-free policies among employed American Indians in Minnesota are unknown.

Another promising strategy to reduce smoking and smoking-related health disparities in the American Indian population is adding multi-modal social support to

tailored cessation programs [25-27]. Few studies have investigated social support as a mediator or buffering factor on the association between perceived stress and smoking with mixed results [28-30]. Social network ties may serve as a social support for quitting and maintaining a smoke-free lifestyle, or they may hinder smoking abstinence [31-38]. However, differences in data collection methodology, populations studied, and definition of 'social support,' make it difficult to compare findings across studies. Only one published study was identified by this author to have assessed types of social support and cigarette smoking [39]. Hodge, Fredericks, and Kipnis (1996) investigated cigarette smoking and social ties in a population of northern California rural and urban tribal clinics participating in a National Cancer Institute funded smoking cessation program. Cigarette smoking (38% rural and 44% urban) and social ties (67% rural and 58% of urban) were high in this population [39]. Three published studies on adult tribal cessation programs with social support methods exist; however *a priori* social networks and perceived social support were not assessed [25-27]. Levels of perceived social support and current cigarette smoking among Minnesota American Indians are unknown.

Study significance, and purpose

American Indians represent a high-risk subgroup for six of the ten leading smoking-related diseases [6-7], cigarette (non-ceremonial or sacred use) smoking, secondhand smoke exposure, and exposure to other chemical hazards and carcinogens involved in blue-collar occupations. However, few studies report on current smoking in the American Indian population and interventions that encourage smoking reduction and cessation such as workplace smoke-free policies and social support [24-27, 39]. The extent and relationship of these promising interventions in the context of cigarette smoking are unknown in the Minnesota American Indian population.

To address this gap, this study examined the association between: workplace smoke-free policies (Specific Aim 1) and social support (Specific Aim 2), and cigarette smoking among a sample of American Indians living in Hennepin and Ramsey counties, Minnesota.

Specific Aim 1

Workplace recreational smoking demographics and correlates

Current smokers in the workforce mirror that of the national smoking population, where the highest prevalence is seen in males (21.5%), those with less than a high school education (28.4%), those without health insurance (28.6%), those living below the federal poverty level (27.7%), and those aged 18-24 years (23.8%) [9]. Studies show significantly more smokers among blue-collar and service workers versus white-collar workers [22, 40-42], with the highest prevalence found in construction and mining industries (~30%) [9].

Workplace social culture such as having more colleagues that smoke at work [43], viewing smoking as a social activity [44], and perceived lower co-worker norms to quit smoking [45] have been identified as factors in promoting smoking behavior among blue-collar and service workers. Other workplace characteristics associated with smoking and smoking intensity among blue-collar and service workers include higher perceived work-related stress [46], lower salaries [43], lengthy work schedules [47], and high physical demands [48], inadequate or absent workplace tobacco cessation services [43,50], and lack of workplace smoke-free policies [43,50].

Workplace smoke-free policies

Smoke-free policies in the United States that encourage smoking reduction and quit attempts include smoking restrictions and bans by location, mainly worksites, buildings, and communities. Twenty-four states, along with the District of Columbia, Puerto Rico, and the U.S. Virgin Islands and 802 local municipalities have complete indoor smoking bans in all workplaces, including restaurants and bars [51]. At least 511 state-regulated casinos/racinos, racetracks, bingo and other betting establishments in the U.S. are 100% smoke-free, and five U.S. tribes and three Canadian Indian nations have casinos that are 100% smoke-free [51].

The state of Minnesota is covered by a comprehensive indoor workplace smoking ban under the 2007 Minnesota Freedom to Breathe Act (*Minnesota Statute* 144.411 to 144.417). Under this statute, smoking is prohibited in virtually all indoor public places

and indoor places of employment where at least two individuals are employed including: bars, restaurants, and private clubs, office and industrial workplaces, retail stores, common areas of rental apartment buildings, hotels, and motels, public transportation including taxis, work vehicles if more than one person is present, home offices with one or more on-site employees or used as a place to meet or deal with customers, public and private educational facilities, auditoriums, arenas, and meeting rooms, day care premises, and health care facilities and clinics. There are some exemptions including outdoor worksites, private homes or residences, sleeping areas of hotels and motels, commercial motor vehicle cabs, family farms, tobacco product shops, theatrical productions, approved patient rooms in licensed residential or institutional healthcare facilities, traditional Native American ceremonies and sovereign tribal lands [52]. Therefore, virtually all indoor worksites except those on tribal lands should be smoke-free.

Tribal sovereignty refers to tribes' right to govern themselves, define their own membership, manage tribal property, and regulate tribal business and domestic relations [53]. Tribally owned lands are subject to federal and tribal regulation, but not state. Therefore, indoor workplaces on Minnesota tribal land and tribally owned buildings do not fall under protection of the Minnesota Freedom to Breathe Act. However, individual worksites on tribal lands, for example tribal government buildings, may have their own smoke-free policies.

Specific Aim 2

Cigarette smoking prevalence

Overall, national trends indicate that cigarette smoking is declining. In the United States smoking prevalence decreased from 19.4% in 2010 to 17.3% in 2014 [3]. Declines in national smoking rates are mirrored in Minnesota with a decreased smoking prevalence of 14.4% in 2014 compared to 16% in 2010 [3]. Despite these encouraging numbers, American Indians consistently have the highest smoking rates of all race and ethnicities with prevalence rates from 23-60% nationwide [14-20]. Few smoking prevalence estimates of adult American Indians living in Minnesota and the Twin Cities-Metro area (including Hennepin and Ramsey counties) exist. The Urban Indian Health Institute

reported a smoking prevalence of 36.6% for Hennepin and Ramsey Counties based on 2005-2010 data from the Behavioral Risk Factor Surveillance System (BRFSS) [54]. A 2007 study based on a convenience sample of 300 American Indians in Minneapolis estimated a 62% smoking prevalence [17]. The 2010-2012 Tribal Tobacco Use Prevalence (TTUP) Study reported a 59% prevalence rate for both the State of Minnesota and Hennepin and Ramsey Counties [4-5].

With the exception of the TTUP Study, precision and validity of tobacco use estimates in the American Indian population are limited by small sample sizes, exclusion or multiracial pooling of American Indian respondents and culturally inappropriate data collection methods such as phone interviews and not differentiating between recreational tobacco use and traditional, ceremonial, or sacred tobacco use.

Traditional tobacco use

Existing tobacco use prevalence studies are confounded by the assumption that tobacco is used for recreational purposes only and does not address the traditional, ceremonial or sacred use that play an important role in American Indian culture. The Minnesota American Indian population, largely composed of enrolled or affiliated members of Ojibwe (Chippewa) or Dakota/Lakota/Nakota (Sioux) tribes, have been noted to use locally grown, traditional tobacco (*Nicotiana rustica*) or red willow bark called kinnikinnick (Ojibwe)/cansasa (Dakota/Lakota/Nakota) mixed with other plants depending on its purpose (prayer, speak with spirits, heal/cleanse). However, commercial tobacco (*Nicotiana tobacum)* in the form of cigarettes and pipe tobacco have been used as a substitute at funerals, Pow Wows, and other ceremonies [55-57].

Since it was illegal for American Indians to practice their culture, traditions, and religion until passage of the American Indian Religious Freedom Act of 1978 (Pub. L. 95-341), some scholars believe that commercial tobacco became engrained in American Indian ceremony because it was easily accessible, acceptable in the predominate white culture, and a way to continue religious practices in secret [17,56]. Thus to avoid bias, it

is important to separate recreational from traditional use of tobacco in smoking surveys that include American Indian participants.

Demographic factors associated with recreational tobacco smoking

Results from the 2013 National Health Interview Survey (NHIS) indicate that the prevalence of current smoking is slightly higher among males (20.5 percent) compared to females (15.3 percent). Additionally, there is a higher prevalence of current smoking in adults under the age of 65 (18.7% 18 to 24 years, 20.1% 25 to 44 years, 19.9% 45 to 64 years and 8.8% $\geq$ 65 years), those with less educational attainment (41.4% General Education Development certificate compared to 14.7% bachelor or graduate/professional degree) and lower incomes (29.2% below the federal poverty level compared to 16.2% at or above the federal poverty level) [6]. These characteristics remain consistent across states and over time [3, 6]. Higher percentages of smokers live in the Southern and Midwestern states [3, 6, 40, 58] and rural versus urban or suburban areas [59]; however it is believed that income, race, and sex differences in smoking behavior strongly influence this trend [3, 20].

This pattern is mirrored in Minnesota's American Indian smoking population. The TTUP Study found that the prevalence of current smoking is slightly higher among males (61 percent) compared to females (57 percent) [4]. Additionally, there was a higher prevalence of current smoking among adults under the age of 65 (55% 18 to 24 years, 70% 25 to 44 years, 54% 45 to 64 years and 26% $\geq$ 65 years) and with less educational attainment (68.2% General Education Development certificate compared to 51.1% two years of college and beyond) [4].

Other factors associated with recreational tobacco smoking

Other factors directly associated with long-term cigarette smoking reported in the literature include: a relatively low perceived risk of harm [60-64], sociocultural mores that normalize smoking [20,65], an increased number of smoking contacts [31-36, 57, 66] 27-33], policies that increase access to cigarettes (i.e., the absence of a tobacco tax, no

indoor air policies) [57, 66-69] and poor mental health and increased psychological stress [66, 70-71].

Stress and social support

One model to explain why American Indians have higher smoking rates is the *Indigenist Stress and Coping Model* developed by Walters, Simoni, and Evans-Campbell (2002) [see **Figure 1**]. The model considers how cultural factors and trauma experienced by oppressed groups in the form of historic trauma (e.g., massacres, forced removal from native lands, boarding school exposure, non-Native custodial care placements, and prohibition of spiritual and cultural practices) [72-74], past and current discrimination [75], stressful life events and daily hassles [76-79] are associated with health outcomes such as heart disease, diabetes and cancer, and addictive behaviors such as cigarette smoking [80-81].

The model also looks at buffering or moderating factors [82-83] such as social support, frequently defined as "the social resources that a person perceives to be available or that are actually provided to them by nonprofessionals in the context of both formal support groups and informal helping relationships" [84]. Social support has been found to be a modifying factor mitigating depression and poor mental health [85-87], impaired physical functioning [88], chronic pain [87,89], smoking [28-30], and cessation attempts [37]. In contrast, low perceived social support has been associated with depression [90-91], low quality of life [91], and increased risk of mortality [92]. For this review, the author identified only one study that investigated social support and smoking in an American Indian population [39]. Given the high rates of cigarette smoking and smoking-related disease in the American Indian population, it is critical to understand what coping strategies or buffers such as social support may be helpful in designing a tailored intervention program.

Chapter 2: Research Design and Methods

Data source

The data for this investigation were derived from the 2010-2012 Tribal Tobacco Use Prevalence (TTUP) Study, a Minnesota statewide cross-sectional tobacco use survey of American Indians modeled after the CDC American Indian Adult Tobacco Survey [95] and the Minnesota Adult Tobacco Survey [96]. The TTUP Study incorporated community-based participatory research (CBPR) and reality-based research (RBR) best practices for working with American Indian communities. CBPR acknowledges the importance of insider-knowledge, giving equal weight to the community as health experts and partners in the pursuit to identify, prioritize, and address community health issues [37, 39, 90-94], RBR adds to the principals of CBPR by incorporating research strategies culturally appropriate to American Indians. Community members work side by side with researchers throughout a project or study to identify key topics or issues, define terms, strategies, outcomes and goals; design data collection instruments; analyze and evaluate data and other information; and determine the best way to present and disseminate the results [97-98]. The research partnership included American Indian members and non-Native academic partners. Throughout the TTUP Study, activities were implemented with the guidance of an American Indian Community Oversight Group (COG) composed of American Indian community members and experts from different disciplines including healthcare, public health, public policy, health education, and tobacco control. The COG helped to ensure data collection, analysis, and reporting was robust, relevant, and useful to the community.

Institutional Review Board approval

The TTUP Study was approved by the University of Minnesota's Institutional Review Board (IRB), Human Subjects Committee (IRB reference number 0903S61641). In addition the study was approved by a Resolution of the Metropolitan Urban Indian Directors and by the Fond du Lac IRB and Indian Health Service IRB. Approval of these American Indian-specific IRBs were critical for this study because as sovereign nations

with a long history of research abuses [99], tribes have the right to data ownership and review and approval of all research being conducted in Indian country.

Respondent driven sampling and recruitment process

An urban sample (Hennepin and Ramsey counties, Minnesota) was collected using respondent driven sampling (RDS), a descendant of snowball sampling used to access populations that are difficult to reach but socially well connected [100]. The COG selected this sampling method because lists used to select samples in other Minnesota geographies were non-existent for this population and area based sampling was not feasible. Prior knowledge and collaborative work with this socially and culturally connected community also supported respondent-driven sampling as the best available method.

American Indian community members from the research team initiated the sampling process with recruitment of five principal recruits (seeds) of various sex and ages. Eligibility criteria for inclusion in the study were: (1) self-identified American Indian, (2) age 18 years or older, (3) resident of Hennepin or Ramsey Counties, Minnesota, and separate residence from the recruiter. Participants (seeds and recruits) were asked to estimate their network size (i.e. how many study-eligible individuals were in their social network and how many of those they felt comfortable recruiting). Seeds received a $15 gift card for participating in the survey, three coupons to distribute to individuals in their social network (unique identification number (id) linked recruiter to recruits) [see **Figure 2**], and an additional $10 gift card per recruit who returned to complete a survey.

Study staff screened all recruits who called to participate in the survey, verifying their coupon id, previous survey participation, and eligibility criteria to reduce the chances of repeat enrollment or ineligible participation. Additionally to ensure against duplicate survey participation, interviewers were instructed to take participant coupons during the time of the survey. This was verified in the database by checking for duplicate coupon ids.

Participants signed an informed consent letter and completed a 30 to 45 minute in-person, interviewer-delivered survey consisting of 127 single, multiple selection, and fill-in questions [see **Appendix 2**]. Questions sought to fill in data gaps on the adult American Indian population in Minnesota with respect to the prevalence of traditional and recreational tobacco use, smoking cessation, secondhand smoke exposure, perceived norms surrounding tobacco use and cessation, and attitudes towards clean indoor air policies. The urban survey was administered at various community centers in Hennepin and Ramsey Counties by twenty interviewers from the community trained in data privacy and HIPAA rules, informed consent process, interviewing methods and conduct of research. This iterative process lasted approximately nine weeks with 12 waves of recruitment starting on March 24, 2011 and ending on May 31, 2011, which resulted in 964 interviews in the total sample [see **Figures 3 and 4**]. Of these, 940 surveys had complete demographic (age, sex, county) information used to weight the data as described in the next section.

Data processing

Surveys were batched, scanned and imported into Microsoft Excel© (2010) (Microsoft Corp., Redmond, WA, USA) and PC-SAS©, Version [9.2] (SAS Institute Inc., Cary, NC, USA) for data cleaning and analysis. Information on recruiters and recruits (e.g. demographic variables such as age, sex, and county and unique coupon ids) were stored in FileMaker®, Version [14.0] (FileMaker, Inc., Santa Clara, CA, USA) on a secured server. The unique coupon-id was necessary for tracking participation, connecting individuals within a social network and linkage to the surveys for later weighting and analysis. No names or other unique identifying features were attached to these ids.

RDS and census weights were applied to the data to ensure that the sample was representative of American Indians in Hennepin and Ramsey Counties, Minnesota. First, the RDS weight was created using RDS Analysis Tool©, Version [5.6] (Cornell University, Ithaca, NY, USA) [101], a public use online tool used to create population

weights and analyze social networks collected using RDS. Per the instructions for creating RDS weights [101], a univariate partition analysis of the 940 surveys with complete data was conducted using age, sex, and county of residence as key parsing variables. This procedure allows the weight to reflect variations in network size based on demographics collected in the survey that may influence network size. Since larger personal network sizes tend to be overrepresented in RDS samples and thus could bias estimates, *pull-in-network size* (select out 1% of outliers; where degree > 1,000) and *adjust average network size* algorithm options were selected to adjust for outliers and larger reported network sizes. The *complete parsing* algorithm option was selected for categorical survey data. The *enhanced data smoothing* algorithm option was selected to include non-recruiting parsing groups in the analysis. Lastly, the default bootstrapping option (2,500 resample with CI= 0.05) was applied. Further description of RDS and the RDS Analysis Tool© is found in Heckathorn (1997, 2002), Salganik and Heckathorn (2004), Volz and Heckathorn (2008), Heckathorn (2011), and Spiller et al (2012).

After comparing the RDS weighted sample demographics to U.S. Census 2010 [see **Table 1**] and finding proportionally more females and Hennepin County residents compared to the census, we applied a second weight based on age, sex, and residence (Hennepin or Ramsey counties) to ensure the sample was representative of the population. Of the 940 surveys available for analysis [see **Table 2**], 257 respondents reported current employment [see **Table 3**].

Conceptual framework

McLeroy et al. (1988) conceptualization of the Social Ecological Model (SEM) [see **Figure 5** and **Table 4**] combines Bronfenbrenner's (1979) Ecological Framework for Human Development with Bandura's (1972) Social Cognitive Theory (SCT) to create a model with two key ideas: (a) *multiple levels*—behavior affects and is affected by multiple levels of influence, and (b) *reciprocal causation*—individual behaviors shape and are shaped by the social environment.

The SEM allows researchers to systematically assess and intervene on five levels of influence: intrapersonal, interpersonal, organizational, community, and public policy

[102]. *Intrapersonal factors* include individual characteristics that influence behavior such as knowledge, skills, and self-efficacy. Applying this construct to American Indian commercial tobacco use, intrapersonal factors include: (1) knowledge of the difference between recreational tobacco use and ceremonial or sacred use of tobacco; and perceived risk about recreational cigarette smoking, secondhand smoke exposure, and adverse health outcomes; (2) self-efficacy to seek information and help from others to quit, such as cessation counseling and proper use of nicotine replacement therapy; and overall health and healthy lifestyle. These factors are likely moderated and/or mediated by smoking status, health status, the smoking status of close contacts, past experience, knowledge, and individual demographics [61, 63, 103-109].

Interpersonal factors include processes and groups such as family, friends, and peers that provide identity and support towards behavior change. Applying this construct to American Indian tobacco use, interpersonal factors include perceived social support from close family, friends, co-workers, and community members for quitting or staying smoke-free. Social support for quitting or staying smoke-free is likely moderated and/or mediated by smoking status, the number of close contacts who smoke, the presence of smoke-free rules in the home, and demographics [31-36, 110-118].

Organizational factors include rules, regulations, policies, structures, constraining or promoting behaviors of organizations such as faith-based and cultural-based organizations. Applying this construct to American Indian commercial tobacco use, cigarette availability and corporate marketing targeted at American Indian people [115-116] hinder cessation, while promoting consumption of commercial tobacco. Tribal faith and cultural-based organizations can promote sacred and traditional tobacco use through elders, spiritual leaders, advocates, and other key stakeholders [116]. These stakeholders can promote cessation of recreational tobacco use through family and community healing ceremonies, cessation counseling, and prohibiting recreational smoking at Pow-Wows and other ceremonies and tribal events [116].

Community factors include community norms and social networks. Applying this construct to American Indian commercial tobacco use, cigarette smoking is largely viewed as a community norm and does not have the stigma attached to the behavior as in

other populations [117-118]. Moreover having multiple close contacts that smoke such as friends, family, coworkers, and community members are good predictors of individual smoking status [31-35] since these contacts may hinder cessation attempts while encouraging social smoking [37, 119]. However, it is also possible that smokers selectively seek out socialization with other smokers [120-121].

Public policy factors include federal, state, local, and tribal policies and laws that regulate or support healthy practices and actions. Applying this construct to American Indian commercial tobacco use, public policy factors include state and federal cigarette taxes and smoke-free regulations such as the Minnesota Freedom to Breathe Act and the federal Family Smoking Prevention and Tobacco Control Act [110-113, 122]. Countering these efforts are tribal establishments exempt from state cigarette taxation [123] and smoke-free indoor laws.

Specific Aims, Hypotheses, and Measures

Applying public policy and interpersonal constructs of McLeroy et al (1988)'s conceptualization of the Social Ecological Model, this study examined the association between the following exposures of interest: (1) workplace smoke-free policies and (2) social support, and the outcome measure of cigarette smoking status (current, former and nonsmoker) among a sample of American Indians living in Hennepin and Ramsey counties, Minnesota.

Specific aim 1 investigated the association of working in an establishment with a smoke-free policy and cigarette smoking, where workplace smoke-free policy (smoking allowed, smoking not allowed) was the exposure or independent variable and cigarette smoking status (current, former and nonsmoker) was the outcome or dependent variable in the analysis [see **Figure 6, Table 5**]. Individuals who reported working in an establishment without a smoke-free policy were hypothesized to be at higher risk of being a current smoker compared to a former smoker or nonsmoker. [22, 45].

To explore smoke-free work policies, the following question from the TTUP Study was used: "[employed only] Which of the following best describes smoking rules in the area where you work? Smoking in my work area is…allowed in all areas, allowed

in some areas, or not allowed at all." A workplace smoking policy variable was created for the analysis collapsing 'smoking allowed in all areas' and 'smoking allowed in some areas' into a single category named 'smoking allowed,' and the category named 'smoking not allowed at all' was kept.

Smoking in this analysis refers to recreational cigarette smoking (non-ceremonial or sacred use) using Foldes et al (2010)'s definition of current, former and nonsmokers. A current smoker defined as having smoked ≥ 100 cigarettes in their lifetime and now smokes every day or some days or smoked less than 100 cigarettes in their lifetime and smokes every day or some days, were 59 percent of the employed sample. Former smokers defined as having smoked ≥ 100 cigarettes in their lifetime and now do not smoke on any days, were 22 percent of the employed sample. The remaining 14 percent were non-smokers, defined as never smoked once in their lifetime or smoked less than 100 cigarettes in their lifetime and now do not smoke on any days.

Guided by the literature examining determinants of working in an establishment with a smoke-free policy and current smoking, covariates of interest or potential confounders included in the analysis were the categorical variables work setting (indoor, outdoor), number of jobs (one job, two or more jobs), and job location (on reservation, off reservation) [22, 45].

Specific aim 2 investigated the association between social support and cigarette smoking, where perceived social support (none, a little or some, or quite a bit or a lot) was the exposure or independent variable and cigarette smoking status (current, former and nonsmoker) was the outcome or dependent variable in the analysis [see **Figure 7, Table 6**]. Individuals who reported no social support from friends and family for quitting or staying smoke free were hypothesized to be at higher risk of being a current smoker compared to a former smoker or nonsmoker [28-30, 32].

To explore social support, the following questions from the TTUP Study were used: 1. "[current smokers] How much support do you think you have among your friends and family for quitting smoking?" and 2. "[former and nonsmokers] How much support do you think you have among your friends and family for staying smoke-free?"

Smoking in this analysis refers to recreational cigarette smoking (non-ceremonial or sacred use) using Foldes et al (2010)'s definition of current, former and nonsmokers. A current smoker defined as having smoked ≥ 100 cigarettes in their lifetime and now smokes every day or some days or smoked less than 100 cigarettes in their lifetime and smokes every day or some days, were 62 percent of the total analyzable sample. Former smokers defined as having smoked ≥ 100 cigarettes in their lifetime and now do not smoke on any days, were 18 percent of the total analyzable sample. The remaining 13 percent were non-smokers, defined as never smoked once in their lifetime or smoked less than 100 cigarettes in their lifetime and now does not smoke on any days.

Guided by the literature examining determinants of both social support and cigarette smoking, covariates of interest or potential confounders included in the analysis were the categorical variables sex (male or female), age (18-24, 25-34, 35-44, 45-64, or 55+), education (never attended high school or some high school, high school graduate, General Educational Development (GED), some college (no degree), two-year technical degree/certificate, or four-year degree and beyond), children in the home (no children or at least one child), smokers in the home (no smokers or at least one smoker), and home smoke-free rule (smoking allowed in the home or smoking not allowed) [28, 30-36, 124-125].

Analytic Approach

Directed Acyclic Graphs

This investigation used Directed Acyclic Graphs (DAGs) to guide the selection of dependent, independent, and confounding variables for inclusion in the analysis. DAGs are a useful epidemiological tool, which graphically encodes a priori assumptions about the relationships between variables (exposure, outcomes, and covariates) allowing researchers to refine their research questions and decide on appropriate analytic plans [126-127].

Specific Aim 1 investigated the association between the presence of a workplace smoke-free policy (exposure or independent variable, X) and smoking status (outcome or

dependent variable, Y) (see **Figure 6**). Exposure to a workplace without a smoke-free policy was hypothesized to be associated with an increased risk of being a current smoker compared to a former smoker or nonsmoker. Whereas exposure to a workplace with a smoke-free policy was hypothesized to be associated with an increased risk of being a former smoker or nonsmoker compared to a current smoker.

To capture an unbiased estimate of the total average association of X (workplace smoking policy = 1 = smoking allowed or 2 = smoking not allowed) and Y (smoking status = 1 = current smoker or 2 = former smoker or 3= nonsmoker), the author used the DAG to select a minimum sufficient set of covariates for inclusion in the regression model from those identified in the literature as being possible confounders. Model 1 covariates included *job location* (on reservation/not on a reservation), *number of jobs* (one job/two or more jobs), and *work setting* (indoor/outdoor).

Specific Aim 2 investigated the association between perceived social support (exposure or independent variable, X) and smoking status (outcome or dependent variable, Y) (see **Figure 7**). Exposure to no perceived social support for quitting or staying smoke-free was hypothesized to be associated with an increased risk of being a current smoker compared to a former smoker or nonsmoker. Whereas having quite a bit or a lot of social support for quitting or staying smoke-free was hypothesized to be associated with an increased risk of being a former smoker or nonsmoker compared to a current smoker.

To capture an unbiased estimate of the total average association of X (perceived social support =1 = none or 2 = some or a little or 3 = quite a bit or a lot) and Y (smoking status = 1 = current smoker or 2 = former smoker or 3= nonsmoker), we used the DAG to select a minimum sufficient set of covariates for inclusion in the regression model from those identified in the literature as being possible confounders. Model 2 covariates included *age* (18-24 years, 25-34 years, 35-44 years, 45-54 years, and 55+ years), *sex* (male, female), *education* (never attended high school/some high school, high school graduate, General Educational Development, some college, technical or certificate program/two-year college, and four year degree and beyond), *number of children in the*

home (no children, at least one child), *home smoke-free rule* (smoking allowed, smoking not allowed), *and smoking contacts in home* (no smokers, at least one smoker).

Log Multinomial Regression Models

Specific Aims 1 and 2 used log multinomial regression models to quantify the risk of cigarette smoking (probability Y of smoking status: 1 = current smoker versus 3 = nonsmoker, 2= former smoker versus 3 = nonsmoker, and 1 = current smoker versus 2= former smoker) as a function of the risk factor or exposure (X) workplace smoking policies (workplace smoking policy: 1 = smoking allowed or 2 = smoking not allowed) (Model 1) and perceived social support (perceived social support: 1 = none or 2 = some or a little or 3 = quite a bit or a lot) (Model 2), as measured by the prevalence ratio.

The prevalence of cigarette smoking in the study population is greater than ten percent (59 percent in the employed sample and 62 percent in the total sample), therefore the prevalence ratio obtain from log multinomial regression is a superior measure of association than the odds ratio obtained from logistic regression models. Using an odds ratio when the prevalence of cigarette smoking is greater than ten percent would produce a biased overestimate of the true risk.

Log multinomial regression models were executed using the SAS Proc Genmod procedure and log link function with a binary distribution. An estimate statement was included in the model to report the best-fit values for each of the prevalence ratios and the EXP option statement to compute standard errors using the delta method and exponentiate the confidence limits.

That is, holding all other X values constant, the prevalence ratio (PR) estimating the risk of being a current smoker or former smoker compared to the risk of being a nonsmoker among those exposed to a workplace without a smoke-free policy (Model 1) or exposed to no social support for quitting or staying smoke-free (Model 2) is: PR = (a/a + b)/(c/c + d) or; the prevalence of the outcome Y = 1 (current smoker) among the exposed X = 2 (works in an establishment without a workplace smoke-free policy) and X = 3 (no social support for quitting or staying smoke-free), divided by the prevalence that the outcome will occur in someone who has X = 1 (works in an establishment with a

workplace smoke-free policy) and X = 1 (quite a bit or a lot of social support among friends and family for quitting or staying smoke free). Regression models assume each X variable contributes independently to the prevalence ratio.

A log multinomial regression model defines the entire population and finds an equation that best predicts a binomial (0,1) outcome Y (current smoker, nonsmoker), Y (current smoker, former smoker) or Y (former smoker, nonsmoker) from one or more continuous or binary X variables (no workplace smoke-free policy, workplace smoke-free policy) or (no social support, quite a bit of social support) or X (no social support, a lot of social support) [128]. Log multinomial regression quantifies the association between a risk factor X (exposure or treatment) and a disease Y (behavior or event), after adjusting for other variables using an iterative maximum likelihood method [128]. In this model, the equation is expressed as the logarithm of the prevalence of current smoking among the exposed, or the log of the overall prevalence ratio for any individual from the individual prevalence ratios for each X variable [128, 178]:

$$\text{Log } [a/(a + b)] = \beta_o + \beta_1 X_1 + \ldots + \beta_k X_k$$

There are three assumptions.

1. The subjects are randomly selected from, or representative of, a larger population.
2. Each subject was selected independently of the others. Knowing the outcome of any one subject does not help predict the outcome of any other subject.
3. No interaction. The influence of any particular X variable is the same for all values of the other X variables.

Study participants (seeds and recruits) in this study were collected using respondent-driven sampling. Seeds and corresponding recruit's differential magnitude of homophily (similarity) or heterophily (dissimilarity), network size, and ability to successfully recruit alters into a study can bias the overall representativeness of the

sample, thus violating assumptions (1) and (2). However, weights applied to the RDS sample minimizes these biases (see **Appendix** and **Discussion**), creating a representative sample that can be analyzed using regression models [129-132]. Assumption (3) in this model is satisfied (see **Figures 6** and **7**).

Chapter 3: Manuscript 1

Cigarette smoking and smoke-free workplace policies in an urban American Indian Population

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Abstract

Background: American Indians have one of the highest rates of cigarette smoking and smoking-related morbidity and mortality in the United States. Few studies exist in the literature that examine effective workforce strategies that encourage smoking cessation such as smoke-free policies in the American Indian population. The purpose of this study was to determine the risk of being a current or former smoker versus nonsmoker when exposed to workplace smoke-free policies in a representative sample of urban adult American Indians. *Methods:* In 2011, the Tribal Tobacco Use Prevalence (TTUP) Study staff administered the American Indian Adult Tobacco Survey in Hennepin and Ramsey Counties, Minnesota. Study-eligible participants were: self-identified American Indians (AI), ages 18 years and older, and residents of Hennepin or Ramsey Counties, Minnesota who had a separate residence from the person who recruited them into the study. Respondent-driven sampling (RDS), an advanced form of

snowball sampling, was used to sample AIs because no list or area-based sampling was feasible. RDS commenced with five initial recruits (seeds) through 12 waves of recruitment (March 24-May 31, 2011), resulting in 964 completed interviews. After removing incomplete surveys, 940 surveys were available for network weighting using RDS Analysis Tool, v 5.6. Additional demographic weights based on U.S. Census 2010 were used to ensure the sample was representative of the population. A log multinomial regression model adjusting for potential confounders (indoor/outdoor work setting, number of jobs, and job location on/off a reservation) analyzed the association between workplace smoke-free policies and smoking status. *Results:* Working in an establishment that lacked a smoke-free policy was associated with a 36 percent increase in risk of being a current smoker (PR = 1.36, 95% CI = 1.29 to 1.42) compared to a former smoker and a 41 percent decrease in risk of being a former smoker (PR = 0.59, 95% CI = 0.55 to 0.64) compared to a nonsmoker. *Conclusion:* Future studies should investigate the work environments of American Indians in Minnesota with respect to smoke-free policies and strategies for encouraging employers to implement and enforce complete smoking bans.

Keywords: American Indian, commercial tobacco, cigarette smoking, smoke-free workplace policy, respondent-driven sampling, community-based participatory research, reality-based research

Introduction

Cigarette smoking is well established as the leading cause of lung cancer in the United States (127,000 deaths or 78% of all lung cancers), and smoking contributes to significant morbidity and mortality due to other respiratory illnesses, cardiovascular diseases, and cancers (8.6 million affected and total 480,000 deaths/year) [8]. National trends indicate that cigarette smoking is declining. In the United States and Minnesota adult smoking prevalence decreased from 19.4% and 16.0%, respectively in 2010 to 17.3% and 14.4%, respectively in 2014 [3]. Among U.S. adults employed in the labor force, smoking decreased from 27.8% during 1987-1994 to 19.6% during 2004-2010, corresponding to roughly 30 million Americans. Despite the marked improvements,

these estimates reveal the population has not achieved the 12% or less prevalence set forth by Healthy People 2010 and 2020 Objective TU-1.1 [9].

The Centers for Disease Control and Prevention estimates smoking-attributable productivity losses and medical expenditures at approximately $3,400 per year for each adult smoker [10]. In addition, a number of studies have found 20-50% higher employer cost burden for smokers compared to never smokers, including an estimated 1% productivity loss due to smoking breaks and $75 billion in healthcare costs, life insurance, illness days, early disability, and workers' compensation [11-13]. This may be even more salient for the American Indian workforce since American Indians have the highest recreational (non-ceremonial or sacred use) smoking prevalence of all race/ethnicities in the U.S. (23-60%) [14-20] and Minnesota (59%) [4-5]. Moreover, nearly half of Minnesota American Indians ages 16 and older in the U.S. civilian workforce were employed in blue-collar and service industries [21]. Blue-collar workers who smoke or are exposed to secondhand smoke may be particularly vulnerable due to synergistic effects that occur with exposure to occupational hazards such as aromatic amines, asbestos, coal, cotton dust, grains, ionizing radiation, pesticides, petrochemicals, silica, and welding materials [22].

Workplace recreational smoking demographics and correlates

Current smokers in the workforce mirror that of the national smoking population, where the highest prevalence is seen in males (21.5%), those with less than a high school education (28.4%), those without health insurance (28.6%), those living below the federal poverty level (27.7%), and those aged 18-24 years (23.8%) [9]. Studies show significantly more smokers among blue-collar and service workers versus white-collar workers [22, 40-42], with the highest prevalence found in construction and mining industries (~30%) [9].

Workplace social culture such as having more colleagues that smoke at work [43], viewing smoking as a social activity [44], and perceived lower co-worker norms to quit smoking [45] have been identified as factors in promoting smoking behavior among blue-collar and service workers. Other workplace characteristics associated with smoking and

smoking intensity among blue-collar and service workers include higher perceived work-related stress [46], lower salaries [43], lengthy work schedules [47], and high physical job-related demands [48], inadequate or absent workplace tobacco cessation services [44, 50], and lack of workplace smoke-free policies [44, 50].

Workplace smoke-free policies

Smoke-free policies in the United States that encourage smoking reduction and quit attempts include smoking restrictions and bans by location, mainly worksites, buildings and communities. Twenty-four states, along with the District of Columbia, Puerto Rico, and the U.S. Virgin Islands and 802 local municipalities have complete indoor smoking bans in all workplaces, including restaurants and bars [51]. At least 511 state-regulated casinos/racinos, racetracks, bingo and other betting establishments in the U.S. are 100% smoke-free, and five U.S. tribes and three Canadian Indian nations have casinos that are 100% smoke-free [51].

The state of Minnesota is covered by a comprehensive indoor workplace smoking ban under the 2007 Minnesota Freedom to Breathe Act (*Minnesota Statute* 144.411 to 144.417). Under this statute, smoking is prohibited in virtually all indoor public places and indoor places of employment where at least two individuals are employed including: bars, restaurants, and private clubs; offices and industrial workplaces, and retail stores; common areas of rental apartment buildings, hotels, and motels; public transportation including taxis and work vehicles if more than one person is present; home offices with one or more on-site employees or used as a place to meet or deal with customers; public and private educational facilities, auditoriums, arenas, and meeting rooms, day care premises, and health care facilities and clinics. There are some exemptions including outdoor worksites, private homes/residences, sleeping areas of hotels and motels, commercial motor vehicle cabs, family farms, tobacco product shops, theatrical productions, approved patient rooms in licensed residential or institutional healthcare facilities, traditional Native American ceremonies and sovereign tribal lands [52]. Therefore virtually all indoor worksites except those on tribal lands should be smoke-free.

Tribal sovereignty refers to tribes' right to govern themselves, define their own membership, manage tribal property, and regulate tribal business and domestic relations [53]. Tribally owned lands are subject to federal and tribal regulation, but not state. Therefore, indoor workplaces on Minnesota tribal land and tribally owned buildings do not fall under protection of the Minnesota Freedom to Breathe Act. However, individual worksites on tribal lands, for example tribal government buildings, may have their own smoke-free policies.

Study purpose

American Indians represent a high risk subgroup for six of the ten leading smoking-related diseases [6-7], cigarette (non-ceremonial or sacred use) smoking, secondhand smoke exposure, and exposure to other chemical hazards and carcinogens involved in blue-collar occupations, yet few studies report on current smoking in the American Indian labor force or workforce interventions that encourage smoking reduction and cessation such as smoke-free policies [24].

The purpose of this study was to investigate the association between workplace smoke-free policies and smoking status in a representative sample of employed adult American Indians residing in Hennepin and Ramsey counties (Twin Cities-Metro Area), Minnesota collected using respondent-driven sampling. We hypothesized that there will be an increased risk in being a current versus former smoker or nonsmoker when exposed to a workplace that lacks a smoke-free policy [43, 50].

Methods

The data for this investigation were derived from the 2010-2012 Tribal Tobacco Use Prevalence (TTUP) Study, a Minnesota statewide cross-sectional tobacco use survey of American Indians modeled after the CDC American Indian Adult Tobacco Survey [95] and the Minnesota Adult Tobacco Survey [96]. The TTUP Study incorporated community-based participatory research (CBPR) and reality-based research (RBR) best practices for working with American Indian communities. CBPR acknowledges the

importance of insider-knowledge, giving equal weight to the community as health experts and partners working to identify, prioritize, and address community health issues [93-94]. RBR adds to the principles of CBPR by incorporating research strategies culturally appropriate to American Indians. Community members work side by side with researchers throughout a project or study to identify key topics or issues, define terms, strategies, outcomes and goals; design data collection instruments; analyze and evaluate data and other information; and determine the best way to present and disseminate the results [97-98]. The research partnership included American Indian members and non-Native academic partners. Throughout the TTUP Study activities were implemented with the guidance of an American Indian Community Oversight Group (COG) composed of American Indian community members and experts from different disciplines including healthcare, public health, public policy, health education, and tobacco control. The COG helped to ensure data collection, analysis, and reporting was robust, relevant, and useful to the community. The TTUP Study was approved by the University of Minnesota's Institutional Review Board (IRB), Human Subjects Committee (IRB reference number 0903S61641). In addition the study was approved by a Resolution of the Metropolitan Urban Indian Directors and by the Fond du Lac IRB and Indian Health Service IRB. Approval of these American Indian-specific IRBs were critical for this study because as sovereign nations with a long history of research abuses [99], tribes have the right to data ownership and review and approval of all research being conducted in Indian country.

An urban sample (Hennepin and Ramsey Counties, Minnesota) was identified using respondent driven sampling (RDS), a descendant of snowball sampling used to access populations that are difficult to reach but socially well connected [100]. We selected this sampling method because lists used to select samples in other Minnesota geographies were non-existent for this population and area-based sampling was not feasible. Prior knowledge and collaborative work with this socially and culturally connected community also supported respondent-driven sampling as the best available method.

American Indian community members from the research team initiated the sampling process with recruitment of five principal recruits (seeds) of various sex and

ages. Eligibility criteria for inclusion in the study were: (1) self-identified American Indian, (2) age 18 years or older, (3) resident of Hennepin or Ramsey counties, Minnesota, and (4) separate residence from the recruiter. Participants (seeds and recruits) were asked to estimate their network size (i.e. how many study-eligible individuals were in their social network and how many of those they felt comfortable recruiting). Seeds received a $15 gift card for participating in the survey, three coupons to distribute to individuals in their social network (unique id linked recruiter to recruits), and an additional $10 gift card per recruit who returned to complete a survey. Participants signed an informed consent letter and completed a 30 to 45 minute in-person, interviewer-delivered survey consisting of 127 single, multiple selection, and fill-in questions. Questions sought to fill in data gaps on the adult American Indian population in Minnesota with respect to the prevalence of traditional and recreational tobacco use, cessation, secondhand smoke exposure, perceived norms surrounding tobacco use and smoking cessation, and attitudes towards clean indoor air policies. The urban survey was administered at various community centers in Hennepin and Ramsey counties, Minnesota by twenty interviewers from the community trained in data privacy and HIPAA rules, informed consent process, interviewing methods and conduct of research. This iterative process lasted approximately nine weeks with 12 waves of recruitment starting on March 24, 2011 and ending on May 31, 2011, which resulted in 964 completed interviews.

Surveys were batched, scanned and imported into Microsoft Excel© (2010) (Microsoft Corp., Redmond, WA, USA) and PC-SAS©, Version [9.2] (SAS Institute Inc., Cary, NC, USA) for data cleaning and analysis. Information on recruiters and recruits (e.g. demographic variables such as age, sex, and county and unique coupon ids) were stored in FileMaker®, Version [14.0] (FileMaker, Inc., Santa Clara, CA, USA) on a secured server. The unique coupon-id was necessary for tracking participation, connecting individuals within a social network and linkage to the surveys for later weighting and analysis. No names or other unique identifying features were attached to these ids.

RDS and census weights were applied to the data to ensure that the sample was representative of American Indians in Minnesota. The RDS weight was first created

using RDS Analysis Tool©, Version [5.6] (Cornell University, Ithaca, NY, USA) [101], a public use online tool used to create population weights and analyze social networks collected using RDS. Per the instructions for creating RDS weights [101], a univariate partition analysis of the 940 surveys with complete data was conducted using age, sex, and county of residence as key parsing variables. This procedure allows the weight to reflect variations in network size based on demographics collected in the survey that may influence network size. Since larger personal network sizes tend to be overrepresented in RDS samples and thus could bias estimates, *pull-in-network size* (select out 1% of outliers; where degree > 1,000) and *adjust average network size* algorithm options were selected to adjust for outliers and larger reported network sizes. The *complete parsing* algorithm option was selected for categorical survey data. The *enhanced data smoothing* algorithm option was selected to include non-recruiting parsing groups in the analysis. Lastly, the default bootstrapping option (2,500 resample with CI= 0.05) was applied. Further description of RDS and the RDS Analysis Tool© is found in Heckathorn (1997, 2002), Salganik and Heckathorn (2004), Volz and Heckathorn (2008), Heckathorn (2011), and Spiller et al (2012). After comparing the RDS weighted sample demographics to U.S. Census 2010 and finding proportionally more females and Hennepin County residents compared to the census, we applied a second weight based on age, sex, and residence (Hennepin or Ramsey counties) to ensure the sample was representative of the population. Of the 940 surveys available for analysis, 257 respondents reported current employment.

This study investigated the association between working in an establishment with a smoke-free policy and cigarette smoking, where workplace smoke-free policy (smoking allowed, smoking not allowed) was the exposure or independent variable and cigarette smoking (current smoking versus no smoking) was the outcome or dependent variable in the analysis. To explore smoke-free work policies, the following question from the TTUP study was used: "[employed only] Which of the following best describes smoking rules in the area where you work? Smoking in my work area is…allowed in all areas, allowed in some areas, or not allowed at all." A workplace smoking policy variable was created for the analysis collapsing 'smoking allowed in all areas' and 'smoking allowed

in some areas' into a single category named 'smoking allowed,' and the category named 'smoking not allowed at all' was kept.

Smoking in this analysis refers to recreational cigarette smoking (non-ceremonial or sacred use) using Foldes et al (2010)'s definition of current, former and nonsmokers. A current smoker defined as having smoked ≥ 100 cigarettes in their lifetime and now smokes every day or some days or smoked less than 100 cigarettes in their lifetime and smokes every day or some days, were 59 percent of the employed sample. Former smokers defined as having smoked ≥ 100 cigarettes in their lifetime and now do not smoke on any days, were 22 percent of the employed sample. The remaining 14 percent were non-smokers, defined as never smoked once in their lifetime or smoked less than 100 cigarettes in their lifetime and now do not smoke on any days.

Guided by the literature examining determinants of working in an establishment with a smoke-free policy and current smoking, covariates of interest or potential confounders included in the analysis were the categorical variables work setting (indoor, outdoor), number of jobs (one job, two or more jobs), and job location (on reservation, off reservation) [22, 45].

Results

Table 1 presents findings from the bivariate analysis of the association between working in an establishment with a smoke-free policy and cigarette smoking status. A higher percentage of those lacking a workplace smoke-free policy were current smokers (68%) versus former smokers (16%) or nonsmokers (17%).

Analysis of the covariates job location, number of jobs and work setting found a higher percentage of those who worked on a reservation were current smokers (70%) versus former smokers (14%) or nonsmokers (17%), although the sample size was small. Moreover a higher proportion of those who held two or more jobs were current smokers (71%) versus former smokers (10%) or nonsmokers (20%). Additionally, a higher percentage of those who worked outdoors were current smokers (72%) versus former smokers (13%) or nonsmokers (16%).

Table 2 presents the findings from log univariate and multinomial regression analyses of the association of working in an establishment with a smoke-free policy on the outcome of being a current or former cigarette smoker versus nonsmoker. Working in an establishment that lacked a smoke-free policy was associated with a 41 percent decrease in risk of being a former smoker (PR = 0.59, 95% CI = 0.55 to 0.64) compared to a nonsmoker.

Table 3 presents the findings from log univariate and multinomial regression analyses of the association of working in an establishment with a smoke-free policy on the outcome of being a current smoker versus former smoker. Working in an establishment that lacked a smoke-free policy was associated with a 36 percent increase in risk of being a current smoker (PR = 1.36, 95% CI = 1.29 to 1.42) compared to a former smoker.

Discussion

Despite overall national and U.S. civilian labor force reductions in cigarette smoking, the Healthy People 2010/2020 goal of 12% or less prevalence has yet to be realized [9]. Identifying and targeting higher risk groups may be one strategy for meeting this goal. American Indians represent one such high risk subgroup since they have a higher burden of smoking-related diseases [6-7], an increased prevalence of cigarette (non-ceremonial or sacred use) smoking and secondhand smoke exposure, and exposure to other chemical hazards and carcinogens involved in blue-collar occupations compared to other groups.

Effective workplace interventions to reduce smoking include comprehensive health insurance coverage for cessation treatments, easily accessible help for those who want to quit, and smoke-free workplace policies [23, 133]. Of these options, studies find comprehensive smoke-free policies to be more effective at reducing population level smoking irrespective of socioeconomic status or race/ethnicity [23].

Our study is the second paper we identified to investigate current cigarette smoking and workplace smoke-free policies in an American Indian population [24] and

the first paper to analyze this relationship in Minnesota. Healthy People 2020 Objective TU-12 calls for an increase in the proportion of persons covered by indoor worksite policies that prohibit smoking from baseline 75.3% among employed adults aged 18 and older to 100%. Only half of American Indians in this study were covered by a 100% smoke-free workplace policy and 48% were not protected by a smoke-free policy. By comparison, over three-quarters of all employed Minnesotans (80.7%) reported protection under a smoke-free workplace policy [3]. And Berg and colleagues' (2013) assessment of smoke-free policies in a sample of Midwestern American Indians reported 62.7% of participants had complete smoke-free workplace policies.

The Minnesota Freedom to Breathe Act (*Minnesota Statute* 144.411 to 144.417) prohibits smoking in any indoor workplace where at least two individuals are employed with few exceptions. It does not cover outdoor locations, vehicles, personal homes, or establishments on sovereign tribal lands. A higher percentage of individuals in our sample who reported working primarily outdoors were current smokers (72%) versus former smokers (13%) or nonsmokers (16%), however the majority of our sample worked indoors (89%) versus outdoors (11%). Also, a higher percentage of those who worked on a reservation were current smokers (70%) versus former smokers (14%) or nonsmokers (17%), although the sample size was small. The nature of the work environment in this population with respect to workplace smoking policies needs further exploration.

We hypothesized that individuals who report working in an establishment without a smoke-free policy will be at higher risk of being a current smoker compared to a former smoker or nonsmoker. [22, 45]. Out data show that working in an establishment lacking a smoke-free policy was associated with a 36 percent increase in risk of being a current smoker compared to a former smoker, and a 41 percent decrease in risk of being a former smoker compared to a nonsmoker. It is possible that current smokers were more likely to select worksites where smoking is not prohibited and former smokers were more likely to select worksites with smoke-free policies. It is also possible that blue-collar worksites that are less likely to have smoke-free policies employ individuals that have

demographics consistent with those of current smokers (male, young, less than high school degree).

Regardless of directionality, studies show that complete smoke-free workplace policies decrease cigarette consumption and encourage quit attempts [110, 134]. Fichtenberg and Glantz (2002) conducted a systematic review with random effects meta-analysis of 26 studies on the effects of smoke-free workplaces in the United States, Australia, Canada, and Germany and found complete smoke-free workplace policies were associated with a reduction in absolute smoking prevalence of 3.8% and a decrease in consumption of 3.1 cigarettes per day per continuing smoker. The combined effect of reduced consumption and cessation decreased total cigarette consumption by 29% within 24 months.

Complete smoke-free workplace policies benefits both employees and employers. Employees reduce their risk of lung and heart disease and cancer through reduced exposure to secondhand smoke. Cessation and cessation maintenance is encouraged through eliminating places to smoke. Employers benefit by lower costs associated with smoke-related building repairs, maintenance, and fire insurance, as well as the cost of higher employee health insurance premiums, workers' compensation claims, lost productivity, and possible litigation claims for an unsafe work environment [49, 135].

Our study is subject to at least four limitations. First, the data were collected by a cross-sectional survey, therefore no causal inferences between the presence of work smoke-free policies and current smoking can be made. Second, all questionnaire responses are self-report and smoking status was not verified biochemically. Third, response bias could have been introduced by the RDS methodology, however the algorithms used in the RDS Analysis Tool© minimize bias. Fourth, the sample over-represents women and Hennepin County residents, though the analysis adjusted for these demographics.

Strengths of our research include the use of data from the Tribal Tobacco Use Prevalence (TTUP) Study, the first statewide tobacco use prevalence survey of Minnesota American Indians to include a large sample size (statewide n= 2,926 and Hennepin and Ramsey counties n= 959) of American Indians alone or in combination with other races.

Another study strength is inclusion of culturally appropriate data collection methods such as differentiating between recreational/non-traditional tobacco use and ceremonial/sacred use and involvement of American Indian community members via community-based participatory research and reality-based research techniques.

Conclusion

Future studies should investigate the work environments of American Indians in Minnesota with respect to smoke-free policies and strategies for encouraging employers to implement and enforce complete smoking bans.

Ethics Approval and Consent to Participate

The TTUP Study was approved by the University of Minnesota's Institutional Review Board (IRB), Human Subjects Committee (IRB reference number 0903S61641). In addition the study was approved by the TTUP Steering Council and Community Oversight Group through a Resolution of the Metropolitan Urban Indian Directors and by the Fond du Lac IRB and Indian Health Service IRB.

Competing Interests

GRSL has no competing interests to report. GRSL was support by the Great Lakes Inter-Tribal Council Native American Research Center for Health, the National Institute for Occupational Safety and Health (NIOSH)'s Education and Research Centers for Occupational Safety and Health, and ClearWay Minnesota[SM] CARA Grant RC-2008-0014. JLF and KLR was supported by ClearWay Minnesota[SM] CARA Grant RC-2008-0014 for work on this study. JP, PMM, AR, MHP, and PJJ have no competing interests to report.

Author Contributions

GRSL and AR performed data cleaning, management, and analysis. GRSL, PMM wrote the paper. JLF, JP, KLR, PJJ, MPH planned and designed the statewide TTUP study. JLF, KLR and GRSL wrote for the CARA grant to support the planning, data collection and dissemination.

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References

See Bibliography of dissertation for list of citations.

Tables

Table 1. Prevalence of workplace smoke-free policies, covariates and smoking status.

n = 257	**Current Smoker (n = 146)**			**Former smoker (n = 57)**			**Nonsmoker (n = 39)**		
Workplace smoking policy (n = 236)	n	Unadj%	Adj%	n	Unadj%	Adj%	n	Unadj%	Adj%
Smoking allowed	64	64.65	67.51	19	19.19	15.46	16	16.16	17.02
Smoking not allowed	77	56.20	56.18	37	27.01	30.85	23	16.79	12.96
Job location (n = 241)									
On reservation	7	70.00	69.50	2	20.00	13.52	1	10.00	16.98
Not on reservation	138	59.74	61.94	55	23.81	23.37	38	16.45	14.69
Number of jobs (n = 241)									
One job	117	58.50	56.78	48	24.00	28.71	35	17.50	14.51
Two or more jobs	28	68.29	70.57	9	21.95	9.80	4	9.76	19.62
Work setting (n = 233)									
Indoors	122	57.82	57.26	53	25.12	26.66	36	17.06	16.08
Outdoors	16	72.73	71.50	4	18.18	12.74	2	9.09	15.76

Table 2. Unadjusted and adjusted models of the association between workplace smoke-free policy and the risk of being a current or former smoker versus nonsmoker.

	Current smokers		**Former smokers**	
Workplace smoking policy	Unadjusted PR (95% CI)	Adjusted PR (95% CI)	Unadjusted PR (95% CI)	Adjusted PR (95% CI)
Smoking allowed	1.04 (0.89 to 1.21)	1.04 (0.99 to 1.09)	0.87 (0.6 to 1.3)	0.59*** (0.55 to 0.64)
Smoking not allowed	Ref	Ref	Ref	Ref
Note: Asterisks indicates statistical significance (*p<0.05, **p<0.01, ***p<0.0001).				

Table 3. Unadjusted and adjusted models of the association between workplace smoke-free policy and the risk of being a current versus former smoker.

	Current smokers	
Workplace smoking policy	Unadjusted PR (95% CI)	Adjusted PR (95% CI)
Smoking allowed	1.15 (0.97 to 1.40)	1.36 (1.29 to 1.42)***
Smoking not allowed	Ref	Ref
Note: Asterisks indicates statistical significance (*p<0.05, **p<0.01, ***p<0.0001).		

Chapter 4: Manuscript 2

Low social support and cigarette smoking in an urban American Indian population

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Abstract

Background: American Indians have one of the highest rates of cigarette smoking and smoking-related morbidity and mortality in the United States. Few American Indian-tailored cessation programs exist in the literature, and even less apply a combined strategy that includes social support. The purpose of this study was to determine the association between social support and smoking status in a representative sample of urban adult American Indians. *Methods*: A log multinomial regression model analyzed the association of perceived support among family and friends for quitting smoking or staying smoke-free on current cigarette smoking adjusting for potential confounders (sex, age, education, children in the home, smokers in the home, and presence of a smoke-free home rule). Urban data (Hennepin and Ramey counties, Minnesota) from the Tribal Tobacco Use Prevalence (TTUP) Study was used in the analysis. Eligibility criteria were: (1) self-identified American Indian (AI), (2) aged 18 years and older, (3) resident of Hennepin or Ramsey counties, Minnesota and (4) separate residence from the recruiter. Respondent-driven sampling (RDS), an advanced form of snowball sampling,

was used to sample AIs because no list of potential participants or area based sampling approach was feasible. RDS commenced with five initial recruits (seeds) through 12 waves of recruitment (March 24-May 31, 2011), resulting in 964 completed interviews. After removing incomplete surveys, 940 surveys were available for network weighting using RDS Analysis Tool, v 5.6. Additional demographic weights based on U.S. Census 2010 were used to ensure the sample was representative of the population. *Results*: Exposure to quite a bit or a lot of social support versus no social support for quitting or staying smoke-free was associated with an 11 percent decrease in risk of being a current smoker (PR = 0.89, 95% CI = 0.86 to 0.91) and an eight percent decrease in risk of being a former smoker (PR = 0.92, 95% CI = 0.88 to 0.95) compared to being a nonsmoker. Also, there was an eight percent decrease in risk of being a current smoker (PR = 0.92, 95% CI = 0.90 to 0.94) compared to a former smoker with exposure to quite a bit or a lot of social support for quitting or staying smoke-free versus no social support.

Conclusions: American Indian smoking cessation programs may benefit from inclusion of family/friend support mechanisms.

Keywords: American Indians, commercial tobacco/cigarette smoking, social support, respondent-driven sampling, community-based participatory research, reality-based research.

Introduction

Cigarette smoking is the leading cause of lung cancer in the United States (127,000 deaths or 78% of all lung cancers), and also accounts for significant morbidity and mortality due to other respiratory illnesses, cardiovascular diseases, and cancers (8.6 million affected and 480,000 total deaths/year) [8]. In Minnesota, six of the ten leading causes of death among American Indians are smoking-related, including lung and bronchus cancer, other cancers (colon and rectal, kidney and renal pelvis), diabetes, heart disease, stroke, and chronic lower respiratory disease [6-7].

Cigarette smoking prevalence

Overall, national trends indicate that cigarette smoking is declining. In the United States smoking prevalence decreased from 19.4% in 2010 to 17.3% in 2014 [3]. Declines in national smoking rates are mirrored in Minnesota with a decreased smoking prevalence of 14.4% in 2014 compared to 16% in 2010 [3]. Despite these encouraging numbers, American Indians consistently have the highest smoking rates of all race/ethnicities with prevalence rates from 23-60% nationwide [14-20]. Few smoking prevalence estimates of adult American Indians living in Minnesota and the Twin Cities-Metro area (including Hennepin and Ramsey counties) exist. The Urban Indian Health Institute reported a smoking prevalence of 36.6% for Hennepin and Ramsey counties based on 2005-2010 data from the Behavioral Risk Factor Surveillance System (BRFSS) [54]. A 2007 study based on a convenience sample of 300 American Indians in Minneapolis estimated a 62% smoking prevalence [17]. The 2010-2012 Tribal Tobacco Use Prevalence (TTUP) Study reported a 59% prevalence rate for both the State of Minnesota and Hennepin and Ramsey counties [4-5].

With the exception of the TTUP Study, precision and validity of tobacco use estimates in the American Indian population are limited by small sample sizes, exclusion or multiracial pooling of American Indian respondents and culturally inappropriate data collection methods such as phone interviews and not differentiating between recreational tobacco use and traditional, ceremonial, or sacred tobacco use.

Traditional tobacco use

Existing tobacco use prevalence studies are confounded by the assumption that tobacco is used for recreational purposes only and does not address the traditional, ceremonial or sacred use that play a huge role in American Indian culture. The Minnesota American Indian population, largely composed of enrolled or affiliated members of Ojibwe (Chippewa) or Dakota/Lakota/Nakota(Sioux) tribes, have been noted to use locally grown, traditional tobacco (*Nicotiana rustica*) or red willow bark called kinnikinnick (Ojibwe)/cansasa (Dakota/Lakota/Nakota) mixed with other plants depending on its purpose (prayer, speak with spirits, heal/cleanse). However,

commercial tobacco (*Nicotiana tobacum)* in the form of cigarettes and pipe tobacco have been used as a substitute at funerals, Pow Wows and other ceremonies [55-57]. Since it was illegal for American Indians to practice their culture, traditions, and religion until passage of the American Indian Religious Freedom Act of 1978 (Pub. L. 95-341), some scholars believe that commercial tobacco became engrained in American Indian ceremony because it was easily accessible, acceptable in the predominate white culture, and a way to continue religious practices in secret [17, 56]. Thus to avoid bias, it is important to separate recreational from traditional use of tobacco in smoking surveys that include American Indian participants.

Demographic factors associated with recreational tobacco smoking

Results from the 2013 National Health Interview Survey (NHIS) indicate that the prevalence of current smoking is slightly higher among males (20.5 percent) compared to females (15.3 percent). Additionally, there is a higher prevalence of current smoking in adults under the age of 65 (18.7% 18 to 24 years, 20.1% 25 to 44 years, 19.9% 45 to 64 years and 8.8% $\geq$ 65 years), those with less educational attainment (41.4% General Education Development certificate compared to 14.7% bachelor or graduate/professional degree) and lower incomes (29.2% below the federal poverty level compared to 16.2% at or above the federal poverty level) [6]. These characteristics remain consistent across states and over time [3, 6]. Higher percentages of smokers live in the Southern and Midwestern states [3, 6, 40, 58] and rural versus urban or suburban areas [59]; however it is believed that income, race, and sex differences in smoking behavior strongly influence this trend [3, 20].

This pattern is mirrored in Minnesota's American Indian smoking population. The TTUP Study found that the prevalence of current smoking is slightly higher among males (61 percent) compared to females (57 percent) [4]. Additionally, there was a higher prevalence of current smoking among adults under the age of 65 (55% 18 to 24 years, 70% 25 to 44 years, 54% 45 to 64 years and 26% $\geq$ 65 years) and with less educational attainment (68.2% General Education Development certificate compared to 51.1% two years of college and beyond) [4].

Other factors associated with recreational tobacco smoking

Other factors directly associated with long-term cigarette smoking reported in the literature include: a relatively low perceived risk of harm [60-64], sociocultural mores that normalize smoking [20,65], an increased number of smoking contacts [31-36, 57, 66] 27-33], policies that increase access to cigarettes (i.e., the absence of a tobacco tax, no indoor air policies) [57, 66-69] and poor mental health and increased psychological stress [66, 70-71].

Stress and social support

One model to explain why American Indians have higher smoking rates is the *Indigenist Stress and Coping Model* developed by Walters, Simoni, and Evans-Campbell (2002). The model considers how cultural factors and trauma experienced by oppressed groups in the form of historic trauma (e.g., massacres, forced removal from native lands, boarding school exposure, non-Native custodial care placements, and prohibition of spiritual and cultural practices) [72-74], past and current discrimination [75], stressful life events and daily hassles [76-79] are associated with health outcomes such as heart disease, diabetes and cancer, and addictive behaviors such as cigarette smoking [80-81].

The model also looks at buffering or moderating factors [82-83] such as social support, frequently defined as "the social resources that a person perceives to be available or that are actually provided to them by nonprofessionals in the context of both formal support groups and informal helping relationships" [84]. Social support has been found to be a modifying factor mitigating depression and poor mental health [85-87], impaired physical functioning [88], chronic pain [87,89], smoking [28-30], and cessation attempts [37]. In contrast, low perceived social support has been associated with depression [90-91], low quality of life [91], and increased risk of mortality [92]. For this review, the author identified only one study that investigated social support and smoking in an American Indian population [39]. Given the high rates of cigarette smoking and smoking-related disease in the American Indian population, it is critical to understand what coping strategies or buffers such as social support may be helpful in designing a tailored intervention program.

The purpose of this study was to investigate the association between social support and cigarette smoking status in a representative sample of adult American Indians in Hennepin and Ramsey counties (Twin Cities-Metro Area), Minnesota collected using respondent-driven sampling. We hypothesized that individuals who report no social support from friends and family for quitting or staying smoke free will be at higher risk of being a current smoker compared to a former smoker or nonsmoker [28-30, 32].

Methods

The data for this investigation was derived from the 2010-2012 Tribal Tobacco Use Prevalence (TTUP) Study, a Minnesota statewide cross-sectional tobacco use survey of American Indians modeled after the CDC American Indian Adult Tobacco Survey and the Minnesota Adult Tobacco Survey [96]. The TTUP Study incorporated community-based participatory research (CBPR) and reality-based research (RBR) best practices for working with American Indian communities. CBPR acknowledges the importance of insider-knowledge, giving equal weight to the community as health experts and partners in the pursuit to identify, prioritize, and address community health issues [37, 39, 90-94], RBR adds to the principals of CBPR by incorporating research strategies culturally appropriate to American Indians. Community members work side by side with researchers throughout a project or study to identify key topics or issues, define terms, strategies, outcomes and goals; design data collection instruments; analyze and evaluate data and other information; and determine the best way to present and disseminate the results [97-98]. The research partnership included American Indian members and non-Native academic partners. Throughout the TTUP Study, activities were implemented with the guidance of an American Indian Community Oversight Group (COG) composed of American Indian community members and experts from different disciplines including healthcare, public health, public policy, health education, and tobacco control. The COG helped to ensure data collection, analysis, and reporting was robust, relevant, and useful to the community.

The TTUP Study was approved by the University of Minnesota's Institutional Review Board (IRB), Human Subjects Committee (IRB reference number 0903S61641). In addition the study was approved by a Resolution of the Metropolitan Urban Indian Directors and by the Fond du Lac IRB and Indian Health Service IRB. Approval of these American Indian-specific IRBs were critical for this study because as sovereign nations with a long history of research abuses [99], tribes have the right to data ownership and review and approval of all research being conducted in Indian country.

An urban sample (Hennepin and Ramsey counties, Minnesota) was collected using respondent driven sampling (RDS), a descendant of snowball sampling used to access populations that are difficult to reach but socially well connected [100]. We selected this sampling method because lists used to select samples in other Minnesota geographies were non-existent for this population and area based sampling was not feasible. Prior knowledge and collaborative work with this socially and culturally connected community also supported respondent-driven sampling as the best available method.

American Indian community members from the research team initiated the sampling process with recruitment of five principal recruits (seeds) of various sex and ages. Eligibility criteria for inclusion in the study were: (1) self-identified American Indian, (2) age 18 years or older, (3) resident of Hennepin or Ramsey counties, Minnesota, and (4) separate residence from the recruiter. Participants (seeds and recruits) were asked to estimate their network size (i.e. how many study-eligible individuals were in their social network and how many of those they felt comfortable recruiting). Seeds received a $15 gift card for participating in the survey, three coupons to distribute to individuals in their social network (unique identification number (id) linked recruiter to recruits), and an additional $10 gift card per recruit who returned to complete a survey.

Participants signed an informed consent letter and completed a 30 to 45 minute in-person, interviewer-delivered survey consisting of 127 single, multiple selection, and fill-in questions. Questions sought to fill in data gaps on the adult American Indian population in Minnesota with respect to the prevalence of traditional and recreational tobacco use, smoking cessation, secondhand smoke exposure, perceived norms

surrounding tobacco use and cessation, and attitudes towards clean indoor air policies. The urban survey was administered at various community centers in Hennepin and Ramsey counties by twenty interviewers from the community trained in data privacy and HIPAA rules, informed consent process, interviewing methods and conduct of research. This iterative process lasted approximately nine weeks with 12 waves of recruitment starting on March 24, 2011 and ending on May 31, 2011, which resulted in 964 completed interviews.

Surveys were batched, scanned and imported into Microsoft Excel© (2010) (Microsoft Corp., Redmond, WA, USA) and PC-SAS © [9.2] (SAS Institute, Inc., Cary, NC, USA) for data cleaning and analysis. Information on recruiters and recruits (e.g. demographic variables such as age, sex, and county and unique coupon ids) were stored in FileMaker®, Version [14.0] (FileMaker, Inc., Santa Clara, CA, USA) on a secured server. The unique coupon-id was necessary for tracking participation, connecting individuals within a social network and linkage to the surveys for later weighting and analysis. No names or other unique identifying features were attached to these ids.

RDS and census weights were applied to the data to ensure that the sample was representative of American Indians in Minnesota. The RDS weight was first created using RDS Analysis Tool©, Version [5.6] (Cornell University, Ithaca, NY, USA) [101], a public use online tool used to create population weights and analyze social networks collected using RDS. Per the instructions for creating RDS weights [101], a univariate partition analysis of the 940 surveys with complete data was conducted using age, sex, and county of residence as key parsing variables. This procedures allows the weight to reflect variations in network size based on demographics collected in the survey that may influence network size. Since larger personal network sizes tend to be overrepresented in RDS samples and thus could bias estimates, *pull-in-network size* (select out 1% of outliers; where degree > 1,000) and *adjust average network size* algorithm options were selected to adjust for outliers and larger reported network sizes. The *complete parsing* algorithm option was selected for categorical survey data. The *enhanced data smoothing* algorithm option was selected to include non-recruiting parsing groups in the analysis. Lastly, the default bootstrapping option (2,500 resample with CI= 0.05) was applied.

Further description of RDS and the RDS Analysis Tool© is found in Heckathorn (1997, 2002), Salganik and Heckathorn (2004), Volz and Heckathorn (2008), Heckathorn (2011), and Spiller et al (2012). After comparing the RDS weighted sample demographics to U.S. Census 2010 and finding proportionally more females and Hennepin county residents compared to the census, we applied a second weight based on age, sex, and residence (Hennepin or Ramsey counties) to ensure the sample was representative of the population.

This study investigated the association between social support and cigarette smoking status, where perceived social support (none, a little or some, or quite a bit or a lot) was the exposure or independent variable and smoking status (current, former and nonsmoking) was the outcome or dependent variable in the analysis. To explore social support, the following questions from the TTUP study were used: 1. "[current smokers] How much support do you think you have among your friends and family for quitting smoking?" and 2. "[former and non-smokers] How much support do you think you have among your friends and family for staying smoke-free?"

Smoking in this analysis refers to recreational cigarette smoking (non-ceremonial or sacred use). The smoking status of survey participants was determined using the definitions provided in Foldes et al (2010). A current smoker was defined as having smoked ≥ 100 cigarettes in their lifetime and now smokes every day or some days or smoked less than 100 cigarettes in their lifetime and smokes every day or some days; current smokers were 62 percent of the total analyzable sample. Former smokers were defined as having smoked ≥ 100 cigarettes in their lifetime and now does not smoke on any days; former smokers were 18 percent of the total analyzable sample. The remaining 13 percent were non-smokers, defined as never smoked once in their lifetime or smoked less than 100 cigarettes in their lifetime and now does not smoke on any days.

Guided by the literature examining determinants of both social support and cigarette smoking, covariates of interest or potential confounders included in the analysis were the categorical variables sex (male or female), age (18-24, 25-34, 35-44, 45-64, or 55+), education (never attended high school or some high school, high school graduate, General Educational Development (GED), some college (no degree), two-year technical

degree/certificate, or four-year degree and beyond), children in the home (no children or at least one child), smokers in the home (no smokers or at least one smoker), and home smoke-free rule (smoking allowed in the home or smoking not allowed) [28, 30-36, 124-125].

Results

Table 1 presents findings from a bivariate analysis of the association of social support on cigarette smoking. A higher percentage of those with no social support were current smokers (86%) versus former smokers (12%) and nonsmokers (2%).

Current smokers were more likely to be male (72%) than former smokers (18%) and nonsmokers (10%). The prevalence of current smoking was highest among those aged 25 to 34 (83%) and lowest among those aged 55 and older (43%). Cigarette smoking was highest among those with less than a four-year degree (66% less than a high school degree) and lowest among those with a four-year degree or post-baccalaureate degree (24%). Current smokers were more likely to have at least one child living in their home (68%) compared to former smokers (22%) and nonsmokers (10%).

Current smokers were more likely to be the only smoker in the house (79%) versus living with at least one other smoker (53%), compared to former smokers (12% no smokers in house versus 30% at least one smoker in house) and nonsmokers (10% no smokers in house versus 18% at least one smoker in house). Also, current smokers were more likely to live in a home where smoking is allowed (84%) compared to former smokers (9%) and nonsmokers (7%).

Table 2 presents findings from log univariate and multinomial regression analyses of the association of perceived social support for quitting or staying smoke-free on the outcome of being a current or former smoker versus nonsmoker. In the univariate model, there was a 29 percent decrease in risk of a being a current smoker (PR = 0.71, 95% CI = 0.65 to 0.78) compared to a nonsmoker with exposure to quite a bit or a lot of social support for quitting smoking versus no social support. Results of the multivariate model show an 11 percent decrease in risk of a being a current smoker (PR = 0.89, 95%

CI = 0.86 to 0.91) and an eight percent decrease in risk of being a former smoker (PR = 0.92, 95% CI = 0.88 to 0.95) compared to being a nonsmoker, respectively with exposure to quite a bit or a lot of social support versus no social support for quitting or staying smoke-free.

Table 3 presents findings from log univariate and multinomial regression analyses of the association of perceived social support for quitting or staying smoke-free on the outcome of being a current versus former smoker. There was a 35 and eight percent decrease in risk of being a current smoker in the univariate (PR = 0.65, 95% = 0.58 to 0.73) and multivariate (PR = 0.92, 95% CI = 0.90 to 0.94) regression analyses, respectively, compared to a former smoker with exposure to quite a bit or a lot of social support for quitting versus no social support.

Discussion

Smoking is a critical issue for Minnesota's sizable American Indian population. In 2010, Minnesota had 101,900 residents (1.9%) who identified themselves as American Indian alone or in combination with another race [1-2]. Approximately 30% of Minnesota American Indians lived in or around the 11 federally recognized Ojibwe (Chippewa) and Dakota/Lakota/Nakota (Sioux) tribes and another 30% lived in Hennepin and Ramsey counties which include the urban cities of Minneapolis-St. Paul [1-2]. In 2010, Minnesota American Indians experienced some of the worst health disparities relative to all other racial and ethnic groups including high rates of cigarette smoking (59%) (compared to 19% overall in Minnesota) and smoking-related morbidity and mortality (lung and bronchus cancer, other cancers, diabetes, heart disease, stroke, and chronic lower respiratory disease) [3-7]. In order to address this health crisis, it is important to gather baseline tobacco use survey data as reported in this paper to understand sociocultural, demographic, and environmental risk factors for current cigarette smoking and develop culturally appropriate public health and policy interventions such as tailored cessation programs and social support networks.

The Tribal Tobacco Use Prevalence (TTUP) Study is the first statewide tobacco use prevalence survey of Minnesota American Indians to include a large sample size (statewide n= 2,926 and Hennepin and Ramsey counties n= 964) of American Indians alone or in combination with other races, collect data in a culturally appropriate manner by differentiating between recreational/non-traditional tobacco use and ceremonial/sacred use and involve community members in the entire research process using community-based participatory research and reality-based research methods.

Our study is the second paper we know of to investigate social support and smoking in an American Indian population [39] and the first paper to analyze this relationship in Minnesota. Consistent with the general population [11], we found current American Indian smokers were more likely to be male, young, and have less educational attainment than nonsmokers.

In our study we report that American Indian current smokers are more likely to be the only smoker in the house compared to former smokers and nonsmokers. Also unexpectedly, current smokers were more likely to have at least one child living in their home compared to former smokers and nonsmokers. Other studies of smokers show that the smoking status of household members and close contacts such as family, friends, coworkers, peers or community members (social network) are good predictors of individual smoking status, motivation for quitting and potential success in quitting [31-36]. Social network ties may serve as a social support for quitting and maintaining a smoke-free lifestyle, or they may hinder smoking abstinence [31-38].

The fact that 68 percent of our sample were current smokers with at least one child living in the home and 84 percent of current smokers allowed smoking in the home is deeply concerning. Children in this population are likely being exposed to secondhand smoke in the home. Moreover, parents serve as role models for their children. Children of parents who smoke are more likely to become smokers [31-38]. The presence of home smoking rules may well be important to cessation as about 60% of all Minnesota smokers with smoke-free rules in their home tried to quit smoking in the past year, compared with 47.9% of those who did not have smoke-free rules at home [137].

Our findings supported our hypothesis that individuals who report no social support from family and friends for quitting smoking or staying smoke-free will be at higher risk of being a current smoker compared to a former smoker or nonsmoker [28-30, 32]. Our data showed an 11 percent decrease in risk of being a current smoker and an eight percent decrease in risk of being a former smoker compared to being a nonsmoker, respectively with exposure to quite a bit or a lot of social support versus no social support for quitting or staying smoke-free. We also found an eight percent decrease in risk of being a current smoker compared to being a former smoker with exposure to quite a bit or a lot of social support versus no social support for quitting or staying smoke-free.

Few studies have investigated social support as a mediator or buffering factor on the effect of perceived stress on smoking [28-30] and their findings have mixed results. Two studies investigated smoking and stress among university students [28-30]. Sun et al (2011) found that students with high levels of stress and depression were more likely to smoke; however, this behavior was mediated by active coping abilities and social support. Steptoe et al (1996) recorded smoking behavior at baseline and within two weeks of an exam among 180 university students divided into two groups, those prone to exam stress (n=115) and controls (not prone to exam stress; n= 65). The exam stress group reported significant increases in perceived stress and emotional distress, but was unaffected by social support availability. Smoking increased by 15.7% in women with few social supports, but remained stable in men compared to the control group suggesting the complexity of models of stress in association with smoking and the influence of factors such as sex, social support, and predisposition to stress. Romano, Bloom, and Syme (1991) examined cigarette smoking, social support, and stress in a representative household sample of adult African Americans in the San Francisco-Oakland Bay Area, California (n= 1,137). Men and women who reported high levels of stress were more likely to smoke than those reporting fewer stressful conditions. Women with underdeveloped social networks were more likely to smoke than those with strong social support (OR= 3.1). However, men lacking emotional support from friends and family were less likely to smoke (OR= 0.5) than men with stronger social networks.

Two studies have looked at social support as a correlate of smoking cessation [37-38] and observed that social support aids short-term abstinence, but not critical long-term cessation. Mermelstein (1986) analyzed two prospective studies of smokers from the University of Oregon Smoking Control Program. They found high levels of partner support and the perceived availability of general support was associated with cessation and short-term (3 months posttreatment) abstinence. The presence of smokers in participants' social networks impeded maintenance and significantly differed between relapsers and long-term (12 months) abstainers.

May et al (2007) investigated correlates of abstinence among a large sample of smokers (n=928) enrolled in a 26-week group-based cessation program. Smoking contacts (OR= 0.81, p=0.008) and perceived individual social support (OR= 1.31, p=0.003) predicted abstinence after 4-weeks from the quit date. However, long term (26-weeks from quit date), the number of smoking contacts (OR= 0.081, p= 0.04) and the frequency with which participants were offered a cigarette (OR= 0.73, p= 0.01), were predictive of long-term abstinence from smoking, but social support was not. In both of these studies, smoking contacts were more predictive of sustained cessation efforts.

Only one published study investigated social support and smoking in an American Indian population [39]. Urban and rural American Indians (n=1,369) who engaged in a National Cancer Institute funded smoking cessation program in 18 Northern California Indian clinics participated in a smoking prevalence survey that included measures of hassles and social support. The authors reported significantly more hassles among urban American Indians compared to rural American Indians; however, only male smoking rates differed by geographic location (urban = 57% versus rural= 43%, p< 0.011). Social support was measured by the types of social organizations to which participants belonged to and the number of supportive close friends and relatives. Rural participants reported more social support (31-67%) compared to their urban counterparts (15-58%). No sex differences in perceived social support were observed. The authors attributed urban-rural differences to the breakdown of social support systems during the 1950s Indian relocation programs. Differences in data collection methodology, populations studied, and definition of 'social support,' make it difficult to compare findings across studies.

Nevertheless, taken together these studies indicate that family, friends, co-workers, and community social supports may play an important role in cessation programs.

Three published adult tribal cessation programs have combined strategies provided in the U.S. Public Health Service's *Clinical Practice Guidelines for Treating Tobacco Use and Dependence* (2008) and American Psychiatric Association approved cognitive behavioral and motivation therapy techniques with 'cultural tailoring' (traditional tobacco education, American Indian designs and imagery used in handouts, and community members serve as counselors): Minnesota Fond du Lac Band of Lake Superior Chippewa's Wiidookowishin (Help Me) Program [25], Menominee Wisconsin Tribal Community's Stop Tobacco Abuse Renew Tradition (STOP) Program [26], and Kansas-Oklahoma Area's All Nations Breath of Life Program [27]. These programs reported 3-6 month quit rates similar to mainstream tobacco cessation programs (~20 to 30%). Social support is encouraged through spouse and/or peer support, community member counseling, and individual and group sessions.

Despite the grim reality of high cigarette smoking and smoking-related disease, most American Indian current smokers in Minnesota want to quit (62% State, 68% Twin Cities Area); half have already made at least one quit attempt [4-5]. Current smokers reported higher interest in cessation strategies that included individual or group support (~40%), traditional teachings and/or ceremonies (~46%), and free/reduced cost nicotine replacement therapy (~46%) and less interest in quit smoking lines (~16%) and Internet support (~13%) [4-5]. Studies of American Indian adults in Minneapolis-St. Paul, Minnesota identified several cessation program preferences: a well-respected American Indian community person to lead the program, the opportunity for connecting with other American Indian participants, peer support options (buddy-program, daily phone calls/check-ins), healthy social support networks, traditional tobacco teachings, and spiritual and cultural techniques (prayer, meditation, storytelling) [4, 138-140].

Given the historic trauma, daily hassles, numerous stressors, and comorbidities faced by American Indian people a sustained, more intensive social support approach may be necessary for dramatic decreases in population-level smoking and smoking-related disease. Health behavior interventions that apply an ecological framework are

promising because they consider multiple types of social networks, while strengthening individual motivation, coping skills, and self-efficacy to quit smoking [141]. Types of social networks tied to an intensive social support strategy include existing network ties, new social linkages, Indigenous natural helpers/community health workers, and the community [142-144] as described below.

(1) *Enhancing existing network ties approach* seek to identify members within an individual's existing social network who are committed and have the resources to provide a sustained social support commitment. These network ties work with the intervention team to change attitudes and behaviors of the support recipient and/or provider [145] with the goal of creating lifelong behavior change such as smoking cessation [146].

(2) *Developing new social linkages approach* seeks to identify new members for inclusion in an individual's social network. This strategy is often used as an additional support or when existing members of a social network are few, overburdened, or unable to provide effective support (i.e. current smokers who are unwilling to quit and support others' quit attempts or individuals inexperienced with the health issue or specific stressors/smoking triggers) [146-147]. New social linkages could include former smokers, respected mentors or advisers, or a current smoker trying to quit (peer/buddy or member of cessation support group).

(3) *Indigenous natural helpers/community health workers approach* [141 148-149] seeks to use well-respected community members and healthcare system navigators to provide what House (1981) refers to as core supportive behaviors-emotional support (empathy, love, trust, and caring), instrumental support (tangible aid and services), informational support (advice, suggestions and information), and appraisal support (constructive feedback and affirmation for self-evaluation), and

(4) *Enhancing networks through community capacity building and problem solving approach* is a community organizing method by which the community identifies problems and solutions. Participation in this collective process

allows individuals to strengthen existing social network ties and develop new ones [150-151].

Our study is subject to at least five limitations. First, data was collected by cross-sectional survey, therefore no causal inferences between social support and current smoking can be made. Second, all questionnaire responses are self-report and smoking status was not verified biochemically. Current smokers may have stated they did not smoke as a more socially acceptable response, however smoking in this population is still perceived as normative. Third, the sample over-represents women and Hennepin County residents, though census weighting adjusted for these demographics. Fourth, response bias could have been introduced by the RDS methodology, however the algorithms used in the RDS Analysis Tool© minimize bias. Lastly, social support was not measured by a comprehensive questionnaire that uses psychosocial scales (e.g., Inventory of Socially Supportive Behaviors, Social Provisions Scale, and ENRICHD Social Support Inventory) to analyze type and magnitude of social support and specific social network ties providing support. However, Barrera (1986) and Gottlieb and Bergen (2010) note that perceived (belief or faith that support is available from network members) versus actual support is most relevant to buffering effects seen in disease and behavior outcomes. Our study used two plain language questions to assess the level of perceived social support for quitting or staying smoke-free and does not make assumptions about how respondents define social support, but rather seeks information on respondent belief or faith that support is available from friends and family. Future studies should conduct a more comprehensive assessment of social support among American Indian smokers in Minnesota; specifically, the types of social support and social network ties that would be helpful towards their efforts at smoking cessation.

Conclusion

A timely opportunity exists to add all four intensive social support strategies discussed in this paper (existing network ties, new social linkages, indigenous natural helpers/community health workers, and community capacity building and problem-

solving) with community specific needs [79-81; 145-151] to existing American Indian cessation programs. Programs need to address the historic and psychological trauma experienced by American Indian people in order to begin the healing process. Education on traditional tobacco, American Indian cultural and spiritual beliefs are critical pieces to maintaining traditional oral history across generations, while encouraging long-term smoking abstinence, and health promoting behaviors. Community strengths such as resiliency and personal experience coupled with the knowledge, emotional, and spiritual support that elders, spiritual leaders and other indigenous natural helpers can offer are largely untapped resources, yet powerful agents of sustainable change.

Ethics Approval and Consent to Participate

The TTUP Study was approved by the University of Minnesota's Institutional Review Board (IRB), Human Subjects Committee (IRB reference number 0903S61641). In addition the study was approved by the TTUP Steering Council and Community Oversight Group through a Resolution of the Metropolitan Urban Indian Directors and by the Fond du Lac IRB and Indian Health Service IRB.

Competing Interests

GRSL has no competing interests to report. GRSL was support by the Great Lakes Inter-Tribal Council Native American Research Center for Health, the National Institute for Occupational Safety and Health (NIOSH)'s Education and Research Centers for Occupational Safety and Health, and ClearWay Minnesota[SM] CARA Grant RC-2008-0014. JLF and KLR was supported by ClearWay Minnesota[SM] CARA Grant RC-2008-0014 for work on this study. JP, PMM, AR, MHP, and PJJ have no competing interests to report.

Author Contributions

GRSL and AR performed data cleaning, management, and analysis. GRSL, PMM wrote the paper. JLF, JP, KLR, PJJ, MPH planned and designed the statewide TTUP study. JLF, KLR and GRSL wrote for the CARA grant to support the planning, data collection and dissemination.

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References

See Bibliography of dissertation for list of citations.

Tables

Table 1. Prevalence of social support and cigarette smoking status.

N = 940	**Current Smoker** (n = 599)			**Former Smoker** (n = 181)			**Nonsmoker** (n = 115)		
Social support (n = 860)	n	Unadj%	Adj%	n	Unadj%	Adj%	n	Unadj%	Adj%
None (1)	176	84.21	85.91	23	11.00	12.08	10	4.78	2.01
A little or some (2)	246	82.83	81.92	36	12.12	12.47	15	5.05	5.61
Quite a bit or a lot (3)	160	45.20	45.01	117	33.05	30.30	77	21.75	24.69
Sex (n = 895)									
Male	226	69.75	71.45	66	20.37	18.37	32	9.88	10.18
Female	373	65.32	63.36	115	20.14	20.55	83	14.54	16.09
Age (n = 895)									
18-24 years	113	72.44	66.34	11	7.05	5.38	32	20.51	28.27
25-34 years	174	74.36	82.54	37	15.81	8.30	23	9.83	9.16
35-44 years	120	71.01	71.60	31	18.34	19.95	18	10.65	8.45
45-54 years	125	66.14	62.58	41	21.69	25.87	23	12.17	11.55
55+ years	67	45.58	43.36	61	41.50	45.94	19	12.93	10.70
Education (n =893)									
Never attended high school or some high school	184	71.60	65.58	39	15.18	19.85	34	13.23	14.57
HS graduate	114	72.61	71.94	27	17.20	15.22	16	10.19	12.84
GED	96	70.59	71.30	27	17.20	17.89	16	10.19	10.81
Some college (no degree)	105	64.81	65.88	32	19.75	19.49	25	15.43	14.63
Tech or certificate/2-year degree	82	62.12	70.46	33	25.00	17.64	17	12.88	11.90
4-year degree and beyond	16	32.65	24.11	21	42.86	59.12	12	24.49	16.77
Children in home (n =888)									

No children	333	68.24	65.87	85	17.42	17.43	70	14.34	16.71
At least one child	261	65.25	68.28	95	23.75	21.63	44	11.00	10.09
Smokers in home (n =890)									
No smokers	363	76.91	78.49	64	13.56	11.83	45	9.53	9.68
At least one smoker	231	55.26	52.83	117	27.99	29.12	70	16.75	18.05
Home smoke-free rule (n =886)									
Smoking allowed	304	85.63	84.04	33	9.30	9.26	18	5.07	6.71
Smoking not allowed	288	54.24	54.36	147	27.68	27.38	96	18.08	18.26

Table 2. Unadjusted and adjusted models of the association between perceived social support and the risk of being a current or former smoker versus nonsmoker.

	Current smokers		**Former smokers**	
Perceived social support	Unadjusted PR (95% CI)	Adjusted PR (95% CI)	Unadjusted PR (95% CI)	Adjusted PR (95% CI)
Quite a bit or a lot	0.71*** (0.65 to 0.78)	0.89*** (0.86 to 0.91)	0.87 (0.67 to 1.11)	0.92*** (0.88 to 0.95)
A little or some	1.00 (0.95 to 1.04)	1.00 (0.96 to 1.03)	1.01 (0.76 to 1.35)	0.99 (0.93 to 1.05)
None	Ref	Ref	Ref	Ref
Note: Asterisks indicates statistical significance (*p<0.05, **p<0.01, ***p<0.0001).				

Table 3. Unadjusted and adjusted models of the association between perceived social support and the risk of being a current versus former smoker.

	Current smokers	
Perceived social support	Unadjusted PR (95% CI)	Adjusted PR (95% CI)
Quite a bit or a lot	0.65 (0.58 to 0.73)***	0.92 (0.90 to 0.94)***
A little or some	0.99 (0.92 to 1.05)	0.99 (0.97 to 1.01)
None	Ref	Ref
Note: Asterisks indicates statistical significance (*p<0.05, **p<0.01, ***p<0.0001).		

Chapter 5. Results

Specific Aim 1

Table 1.1. presents the results of a bivariate analysis of the association between workplace location and presence of a workplace smoke-free policy. A higher proportion of individuals who worked on a reservation (where the Minnesota Freedom to Breathe Act does not apply) reported lack of a smoke-free policy (99%) versus having a smoke-free policy (1%), although the sample size was small.

Among individuals who worked indoors, a slightly higher percentage worked in an establishment that lacked a workplace smoke-free policy (51%) versus worked in an establishment with a smoke-free policy (49%). When categorically asked about their specific workplace location, 55 percent who worked out of their home, someone else's home or vehicle reported lack of a workplace smoke-free policy and 46 percent reported having a workplace smoke-free policy.

Table 1.1. Prevalence of workplace location and smoke-free policies.

n=257	**Smoking allowed** (n=106)			**Smoking not allowed at all** (n=144)		
Workplace location	n	Unadj%	Adj%	n	Unadj%	Adj%
Job location (n=250)						
On reservation	9	90.00	98.81	1	10.00	1.19
Not on reservation	97	40.42	47.44	143	59.58	52.56
Work setting (n=245)						
Indoors	87	39.55	51.18	133	60.45	48.82
Outdoors	19	76.00	65.52	6	24.00	34.48
Job in home or vehicle (n = 245)						
Home or vehicle	22	46.81	54.53	25	53.19	45.47
Not a home or vehicle	65	37.57	50.17	108	62.43	49.83

Table 1.2 presents the results of a bivariate analysis of the association between working in an establishment with a smoke-free policy and current cigarette smoking. A higher percentage of those lacking a workplace smoke-free policy were current smokers (68%) versus former smokers (16%) or nonsmokers (17%).

Analysis of the covariates job location, number of jobs and work setting found a higher percentage of those who worked on a reservation were current smokers (70%) versus former smokers (14%) or nonsmokers (17%), although the sample size was small. Moreover a higher proportion of those who held two or more jobs were current smokers (71%) versus former smokers (10%) or nonsmokers (20%). Additionally, a higher percentage of those who worked outdoors were current smokers (72%) versus former smokers (13%) or nonsmokers (16%).

Table 1.2. Prevalence of workplace smoke-free policies, covariates and smoking status.

n = 257	**Current Smoker (n = 146)**			**Former smoker (n = 57)**			**Nonsmoker (n = 39)**		
Workplace smoking policy (n = 236)	N	Unadj%	Adj%	n	Unadj%	Adj%	n	Unadj%	Adj%
Smoking allowed	64	64.65	67.51	19	19.19	15.46	16	16.16	17.02
Smoking not allowed	77	56.20	56.18	37	27.01	30.85	23	16.79	12.96
Job location (n = 241)									
On reservation	7	70.00	69.50	2	20.00	13.52	1	10.00	16.98
Not on reservation	138	59.74	61.94	55	23.81	23.37	38	16.45	14.69
Number of jobs (n = 241)									
One job	117	58.50	56.78	48	24.00	28.71	35	17.50	14.51
Two or more jobs	28	68.29	70.57	9	21.95	9.80	4	9.76	19.62
Work setting (n = 233)									
Indoors	122	57.82	57.26	53	25.12	26.66	36	17.06	16.08
Outdoors	16	72.73	71.50	4	18.18	12.74	2	9.09	15.76

Table 1.3 below presents the findings from log univariate and multinomial regression analyses of the association of working in an establishment with a smoke-free policy on the outcome of being a current or former cigarette smoker versus a nonsmoker. There was a 41 percent decrease in risk of being a former smoker (PR = 0.59, 95% CI = 0.55 to 0.64) compared to a nonsmoker with exposure to working in an establishment that lacked a smoke-free policy.

Table 1.3. Unadjusted and adjusted models of the association between workplace smoke-free policy and smoking –prevalence ratio of current and former smokers versus nonsmokers.

	Current smokers		**Former smokers**	
Workplace smoking policy	Unadjusted PR (95% CI)	Adjusted PR (95% CI)	Unadjusted PR (95% CI)	Adjusted PR (95% CI)
Smoking allowed	1.04 (0.89 to 1.21)	1.04 (0.99 to 1.09)	0.87 (0.6 to 1.3)	0.59*** (0.55 to 0.64)
Smoking not allowed	Ref	Ref	Ref	Ref
Note: Asterisks indicates statistical significance (*p<0.05, **p<0.01, ***p<0.0001).				

Table 1.4 below presents the findings from log univariate and multivariate regression analyses of the association of working in an establishment with a smoke-free policy on the outcome of being a current smoker versus former smoker. There was a 36 percent increase in risk of being a current smoker (PR = 1.36, 95% CI = 1.29 to 1.42) compared to a former smoker when exposed to a working environment that lacks a smoke-free policy.

Table 1.4. Unadjusted and adjusted models of the association between workplace smoke-free policy and smoking – prevalence ratio of current smokers versus former smokers.

	Current smokers	
Workplace smoking policy	Unadjusted PR (95% CI)	Adjusted PR (95% CI)
Smoking allowed	1.15 (0.97 to 1.40)	1.36 (1.29 to 1.42)***
Smoking not allowed	Ref	Ref
Note: Asterisks indicates statistical significance (*p<0.05, **p<0.01, ***p<0.0001).		

Specific Aim 2

Table 2.1 below presents findings from a bivariate analysis of the association of social support on cigarette smoking. A higher percentage of those with no social support were current smokers (86%) versus former smokers (12%) and nonsmokers (2%).

Current smokers were more likely to be male (72%) than former smokers (18%) and nonsmokers (10%). The prevalence of current smoking was highest among those aged 25 to 34 (83%) and lowest among those aged 55 and older (43%). Cigarette smoking was highest among those with less than a four-year degree (66% less than a high school degree) and lowest among those with a four-year degree or post-baccalaureate degree (24%). Current smokers were more likely to have at least one child living in their home (68%) compared to former smokers (22%) and nonsmokers (10%).

Current smokers were more likely to be the only smoker in the house (79%) versus living with at least one other smoker (53%), compared to former smokers (12% no smokers in house versus 30% at least one smoker in house) and nonsmokers (10% no smokers in house versus 18% at least one smoker in house). Also, current smokers were more likely to live in a home where smoking is allowed (84%) compared to former smokers (9%) and nonsmokers (7%).

Table 2.1. Prevalence of social support and cigarette smoking status.

N = 940	**Current Smoker** (n = 599)			**Former Smoker** (n = 181)			**Nonsmoker** (n = 115)		
Social support (n = 860)	n	Unadj%	Adj%	n	Unadj%	Adj%	n	Unadj%	Adj%
None (1)	176	84.21	85.91	23	11.00	12.08	10	4.78	2.01
A little or some (2)	246	82.83	81.92	36	12.12	12.47	15	5.05	5.61
Quite a bit or a lot (3)	160	45.20	45.01	117	33.05	30.30	77	21.75	24.69
Sex (n = 895)									
Male	226	69.75	71.45	66	20.37	18.37	32	9.88	10.18
Female	373	65.32	63.36	115	20.14	20.55	83	14.54	16.09
Age (n = 895)									

18-24 years	113	72.44	66.34	11	7.05	5.38	32	20.51	28.27
25-34 years	174	74.36	82.54	37	15.81	8.30	23	9.83	9.16
35-44 years	120	71.01	71.60	31	18.34	19.95	18	10.65	8.45
45-54 years	125	66.14	62.58	41	21.69	25.87	23	12.17	11.55
55+ years	67	45.58	43.36	61	41.50	45.94	19	12.93	10.70
Education (n =893)									
Never attended high school or some high school	184	71.60	65.58	39	15.18	19.85	34	13.23	14.57
HS graduate	114	72.61	71.94	27	17.20	15.22	16	10.19	12.84
GED	96	70.59	71.30	27	17.20	17.89	16	10.19	10.81
Some college (no degree)	105	64.81	65.88	32	19.75	19.49	25	15.43	14.63
Tech or certificate/2-year degree	82	62.12	70.46	33	25.00	17.64	17	12.88	11.90
4-year degree and beyond	16	32.65	24.11	21	42.86	59.12	12	24.49	16.77
Children in home (n =888)									
No children	333	68.24	65.87	85	17.42	17.43	70	14.34	16.71
At least one child	261	65.25	68.28	95	23.75	21.63	44	11.00	10.09
Smokers in home (n =890)									
No smokers	363	76.91	78.49	64	13.56	11.83	45	9.53	9.68
At least one smoker	231	55.26	52.83	117	27.99	29.12	70	16.75	18.05
Home smoke-free rule (n =886)									
Smoking allowed	304	85.63	84.04	33	9.30	9.26	18	5.07	6.71
Smoking not allowed	288	54.24	54.36	147	27.68	27.38	96	18.08	18.26

Table 2.2 below presents findings from log univariate and multivariate regression analyses of the association of perceived social support for quitting or staying smoke-free on the outcome of being a current or former smoker versus nonsmoker. In the univariate model, there was a 29 percent decrease in risk of a being a current smoker (PR = 0.71, 95% CI = 0.65 to 0.78) compared to a nonsmoker with exposure to quite a bit or a lot of social support for quitting smoking versus no social support. Results of the multivariate model show an 11 percent decrease in risk of a being a current smoker (PR = 0.89, 95% CI = 0.86 to 0.91) and an eight percent decrease in risk of being a former smoker (PR = 0.92, 95% CI = 0.88 to 0.95) compared to being a nonsmoker, respectively with exposure to quite a bit or a lot of social support versus no social support for quitting or staying smoke-free.

Table 2.2. Unadjusted and adjusted models of the association between perceived social support and smoking – prevalence ratio of current smokers and former smokers versus nonsmokers.

	Current smokers		**Former smokers**	
Perceived social support	Unadjusted PR (95% CI)	Adjusted PR (95% CI)	Unadjusted PR (95% CI)	Adjusted PR (95% CI)
Quite a bit or a lot	0.71*** (0.65 to 0.78)	0.89*** (0.86 to 0.91)	0.87 (0.67 to 1.11)	0.92*** (0.88 to 0.95)
A little or some	1.00 (0.95 to 1.04)	1.00 (0.96 to 1.03)	1.01 (0.76 to 1.35)	0.99 (0.93 to 1.05)
None	Ref	Ref	Ref	Ref
Note: Asterisks indicates statistical significance (*p<0.05, **p<0.01, ***p<0.0001).				

Table 2.3 below presents findings from log univariate and multivariate regression analyses of the association of perceived social support for quitting or staying smoke-free on the outcome of being a current versus former smoker. There was a 35 and eight percent decrease in risk of being a current smoker in the univariate (PR = 0.65, 95% = 0.58 to 0.73) and multivariate (PR = 0.92, 95% CI = 0.90 to 0.94) logistic regression analyses, respectively, compared to a former smoker with exposure to quite a bit or a lot of social support for quitting versus no social support.

Table 2.3. Unadjusted and adjusted models of the association between perceived social support and smoking – prevalence ratio of current smokers versus former smokers.

	Current smokers	
Perceived social support	Unadjusted PR (95% CI)	Adjusted PR (95% CI)
Quite a bit or a lot	0.65 (0.58 to 0.73)***	0.92 (0.90 to 0.94)***
A little or some	0.99 (0.92 to 1.05)	0.99 (0.97 to 1.01)
None	Ref	Ref
Note: Asterisks indicates statistical significance (*p<0.05, **p<0.01, ***p<0.0001).		

Chapter 6. Discussion

Specific Aim 1

Our data on American Indians residing in two large urban Minnesota counties show that participants who worked in an establishment that lacked a smoke-free policy had a 36 percent increased risk of being a current smoker compared to being a former smoker. Lack of a workplace smoke-free policy and resultant exposure to secondhand smoke establishes smoking as a workplace cultural norm and may reinforce smoking behavior, while hindering quit attempts [43-45, 110-111]. This study is only the second paper to investigate current cigarette smoking and workplace smoke-free policies in an American Indian population [24] and the first paper to analyze this relationship in Minnesota.

Healthy People 2020 calls for an increase in the proportion of persons covered by indoor worksite policies that prohibit smoking from a baseline of 75.3% among employed adults ages 18 and older to 100%. Only half of American Indians in this study were covered by a 100% smoke-free workplace policy and 48% were not protected by a smoke-free policy. By comparison, over three-quarters of all employed Minnesotans (80.7%) reported protection under a smoke-free workplace policy [137].

Despite overall national and U.S. civilian labor force reductions in cigarette smoking, the Healthy People 2010/2020 goal of 12% or less prevalence has yet to be realized [9]. Identifying and targeting higher risk groups may be one strategy for meeting this goal. American Indians represent one such high risk subgroup since they have a higher burden of smoking-related diseases [6-7], an increased prevalence of cigarette (non-ceremonial or sacred use) smoking and secondhand smoke exposure, and exposure to other chemical hazards and carcinogens involved in blue-collar occupations compared to other groups.

Effective workplace interventions to reduce smoking include comprehensive health insurance coverage for cessation treatments, easily accessible help for those who want to quit, and smoke-free workplace policies [23, 133]. Of these options, studies find

comprehensive smoke-free policies to be more effective at reducing population level smoking irrespective of socioeconomic status or race/ethnicity [23].

The Minnesota Freedom to Breathe Act (*Minnesota Statute* 144.411 to 144.417) prohibits smoking in any indoor workplace where at least two individuals are employed with few exceptions. It does not cover outdoor locations, vehicles, independently owned residences, or establishments on sovereign tribal lands. Most of the employed adults in our sample that worked outdoors reported lack of a workplace smoke-free policy (66%) versus having a smoke-free policy (35%), and few individuals worked on a reservation (n = 10).

A slightly higher percentage of American Indian adults who worked indoors reported lack of a workplace smoke-free policy (51%) versus having a smoke-free policy (49%). More than half (55%) of adults that worked out of their home, someone else's home or vehicle reported lack of a workplace smoke-free policy, while 46 percent reported having a workplace smoke-free policy. The nature of the work environment in this population with respect to workplace smoking policies needs further exploration.

Regardless of directionality, studies show that complete smoke-free workplace policies decrease cigarette consumption and encourage quit attempts [110-111]. Fichtenberg and Glantz (2002) conducted a systematic review with random effects meta-analysis of 26 studies on the effects of smoke-free workplaces in the United States, Australia, Canada, and Germany and found complete smoke-free workplace policies were associated with a reduction in absolute smoking prevalence of 3.8% and a decrease in consumption of 3.1 cigarettes per day per continuing smoker. The combined effect of reduced consumption and cessation decreased total cigarette consumption by 29% within 24 months.

Complete smoke-free workplace policies benefits both employee and employer. Employees reduce their risk of lung and heart disease and cancer through reduced exposure to secondhand smoke. Cessation and cessation maintenance is encouraged through eliminating places to smoke. Employers benefit by lower costs associated with smoke-related building repairs, maintenance, and fire insurance, as well as the cost of

higher employee health insurance premiums, workers' compensation claims, lost productivity, and possible litigation claims for an unsafe work environment [49, 135].

Specific Aim 2

This study found an 11 percent decrease in risk of a being a current smoker and an eight percent decrease in risk of being a former smoker compared to being a nonsmoker, respectively with exposure to quite a bit or a lot of social support versus no social support for quitting for staying smoke-free. Social network ties (friends and family) may serve as a social support for quitting and maintaining a smoke-free lifestyle, or they may hinder smoking abstinence [27, 32-38].

Consistent with the general population [20], a higher prevalence of current cigarette smoking was present among American Indian males, under the age of 55 with less educational attainment living in Hennepin and Ramsey Counties, Minnesota.

American Indian current smokers were more likely to be the only smoker in the house compared to former smokers and nonsmokers. Also unexpectedly, current smokers were more likely to have at least one child living in their home compared to former smokers and nonsmokers. Other studies of smokers show that the smoking status of household members and close contacts such as family, friends, coworkers, peers or community members (social network) are good predictors of individual smoking status, motivation for quitting and potential success in quitting [31-36]. Social network ties may serve as a social support for quitting and maintaining a smoke-free lifestyle, or they may hinder smoking abstinence [31-38].

The fact that 68 percent of the sample were current smokers with at least one child living in the home and 84 percent of current smokers allowed smoking in the home is deeply concerning. Children in this population are likely being exposed to secondhand smoke in the home. Moreover, parents serve as role models for their children. Children of parents who smoke are more likely to become smokers [31-38]. The presence of home smoking rules may well be important to cessation as about 60% of all Minnesota smokers

with smoke-free rules in their home tried to quit smoking in the past year, compared with 47.9% of those who did not have smoke-free rules at home [137].

This study is the second paper to date to investigate social support and smoking in an American Indian population [39] and the first paper to analyze this relationship in Minnesota. Hodge et al (1996) investigated social support and smoking among an American Indian sample of 18 Northern California clinics that participated in a National Cancer Institute funded smoking cessation program. A survey administered to participants revealed American Indian males but not females living in urban areas had statistically higher smoking prevalence compared to their rural counterparts [39]. American Indians living in rural areas had statistically higher levels of social support compared to their urban peers as measured by membership in social organizations and the number of supportive close friends and relatives, which the authors attribute to the breakdown of social support systems during the 1950s Indian relocation programs. No differences were found in social support by smoking status.

A few studies on other populations have investigated social support as a mediator or buffering factor on smoking [83-84]. Sun et al (2011), Steptoe et al (1996), and Romano, Bloom, and Syme (1991) found that smoking among individuals with high levels of stress and depression was mediated by social support. However, this was observed in women only. Other studies have looked at social support as a correlate of smoking cessation [37-38] and found that social support aids short-term abstinence, but not critical long-term cessation.

Differences in data collection methodology, populations studied, and definition of ‘social support, make it difficult to compare findings across studies. Nevertheless, taken together these studies indicate that family, friends, co-workers, and community social supports may play an important role in cessation programs.

Despite the grim reality of high cigarette smoking and smoking-related disease, most American Indian current smokers in Minnesota want to quit (62% State, 68% Hennepin and Ramsey Counties); half have already made at least one quit attempt [3-4]. Current smokers reported higher interest in cessation strategies that included individual or group support (~40%), traditional teachings and/or ceremonies (~46%), and free or

reduced cost nicotine replacement therapy (~46%) and less interest in quit smoking lines (~16%) and Internet support (~13%) [3-4]. Studies of American Indian adults in Minneapolis-St. Paul, Minnesota identified several cessation program preferences: having a well- respected American Indian community person to lead the program, having the opportunity for connecting with other American Indian participants, and providing peer support options (buddy-program, daily phone calls/check-ins), healthy social support networks, traditional tobacco teachings, and spiritual and cultural techniques (prayer, meditation, storytelling) [4, 138-140].

Three published studies on adult tribal cessation programs provide important evidence-based measures to support American Indians in their desire to quit. These programs combine strategies provided in the U.S. Public Health Service's *Clinical Practice Guidelines for Treating Tobacco Use and Dependence* (2008) and American Psychiatric Association approved cognitive behavioral and motivation therapy techniques with 'cultural tailoring' (traditional tobacco education, American Indian designs and imagery used in handouts, and community members serve as counselors): Minnesota Fond du Lac Band of Lake Superior Chippewa's Wiidookowishin (Help Me) Program [25], Menominee Wisconsin Tribal Community's Stop Tobacco Abuse Renew Tradition (STOP) Program [26], and Kansas-Oklahoma Area's All Nations Breath of Life Program [27]. These programs reported 3-6 month quit rates similar to mainstream tobacco cessation programs (~20 to 30%). Social support is encouraged through spouse and/or peer support, community member counseling, and individual and group sessions.

Given the historic trauma, daily hassles, numerous stressors, and comorbidities faced by American Indian people a sustained, more intensive social support approach may be necessary for dramatic decreases in population level smoking and smoking-related disease. Health behavior interventions that apply an ecological framework are promising because they consider multiple types of social networks, while strengthening individual motivation, coping skills, and self-efficacy to quit smoking [141]. Types of social networks tied to an intensive social support strategy include: (1) existing network ties, (2) new social linkages, (3) indigenous natural helpers/community health workers, and (4) community capacity building and problem- solving [142-144].

Enhancing existing network ties approach seek to identify members within an individual's existing social network who are committed and have the resources to provide a sustained social support commitment. These network ties work with the intervention team to change attitudes and behaviors of the support recipient and/or provider [145] with the goal of creating lifelong behavior change such as smoking cessation [146].

Developing new social linkages approach seeks to identify new members for inclusion in an individual's social network. This strategy is often used as an additional support or when existing members of a social network are few, overburdened, or unable to provide effective support (i.e. current smokers who are unwilling to quit and support others' quit attempts or individuals inexperienced with the health issue or specific stressors/smoking triggers) [146-147]. New social linkages could include former smokers, respected mentors or advisers, or a current smoker trying to quit (peer/buddy or member of cessation support group).

Indigenous natural helpers/community health workers approach [141, 148-149] seeks to use well-respected community members and healthcare system navigators to provide what House (1981) refers to as core supportive behaviors-emotional support (empathy, love, trust, and caring), instrumental support (tangible aid and services), informational support (advice, suggestions and information), and appraisal support (constructive feedback and affirmation for self-evaluation).

Lastly, *Enhancing networks through community capacity building and problem-solving approach* is a community organizing method by which the community identifies problems and solutions. Participation in this collective process allows individuals to strengthen existing social network ties and develop new ones [150-151].

Study Limitations

Study design: First, data was collected by a cross-sectional survey. No causal inferences between the presence of workplace smoke-free policies or social support and current smoking can be made, only associations. However, the large sample size (n = 964 total and 940 analyzed) increases the statistical power of observed associations and reduces the chance that associations are due to chance alone. Secondly, there is

uncertainty of the temporal relationships between smoke-free policies or social support and current smoking. This study cannot determine whether or not smoke-free policies or social support preceded current smoking or non-smoking.

Information bias: All questionnaire responses are self-report and smoking status was not verified biochemically. In general, studies of self-reported cigarette smoking typically yields lower prevalence estimates than studies of serum cotinine, a byproduct and marker of nicotine exposure [155]. However, several authors examining self-reported, current tobacco use measures have found these measures to be valid and reliable, except in communities where smoking is perceived as socially unacceptable or socially unacceptable among females [156-161]. In the Twin Cities American Indian community (includes Hennepin and Ramsey counties) smoking is perceived as normative among both sexes, therefore misclassification of self-reported measures is likely low [17].

Coverage, selection, and response bias: Study participants were identified using respondent-driven sampling an approach which is propelled by peer recruitment, a dual incentive system, and network size. Unlike a random sample, those with larger networks are more likely to be included in the sample. Network bias, a type of selection bias, may have been introduced by the RDS methodology, however the algorithms used in the RDS Analysis Tool© minimizes the bias.

Additionally, in respondent-driven sampling it is possible that recruiters are more likely to select recruits who they feel will benefit from participating in the study or are within close proximity to their place of residence and subsequently people who are demographically similar (homophily) thus introducing coverage and selection bias [162]. Homophily measures of county, sex, and age of residence investigated in this study indicated preferential recruitment within social networks [see **Appendix 1**]. Overall, women and Hennepin County residents were overrepresented in the sample, however weighting with census data adjusted for these demographics.

Unmeasured covariates and measurement error: Specific Aim 1 sought to understand the association between workplace smoking policies and current cigarette smoking. Outdoor work location and working on a reservation affect this relationship

since these locations are not covered by the Minnesota Freedom to Breathe Act. Standard Occupational Classification (SOC) codes and other measures used by federal agencies to classify workers into specific occupational categories and work settings were not feasible to include in the TTUP questionnaire. Instead, those who reported employment were asked two core questions:

- Q72/Is your primary job located on a reservation or off-reservation? Response options were: on a reservation, off a reservation, both on and off a reservation, don't know/not sure, and refused; and
- Q73/What best describes your current primary job's worksite? Response options were: airport, bank, bar, casino, clinic, entertainment (arcade, movie), home (yours), home (someone else's), hospital or emergency room, hotel/motel/lodge, library or museum, office, outside (e.g. construction, fishing, or lawn care), plant/factor/warehouse, restaurant (serves alcohol), restaurant (no alcohol), school, store (gas or convenience), store (other retail, mall) vehicle, some other setting, don't know/not sure, or refused.

Q73 was coded as "indoor" or "outdoors" in a new variable called 'workplace setting' [see **Table 5**]. Unexpectedly, a slightly higher proportion of participants who worked indoors reported lack of a workplace smoke-free policy compared to having a workplace smoke-free policy. However, further investigation into their worksite location found that they worked out of their home or someone else's home or a vehicle.

Lastly, social support was not measured by a comprehensive questionnaire that uses psychosocial scales (e.g., Inventory of Socially Supportive Behaviors, Social Provisions Scale, and ENRICHD Social Support Inventory) to analyze type and magnitude of social support and specific social network ties providing support.

However, Barrera (1986) and Gottlieb and Bergen (2010) note that perceived (belief or faith that support is available from network members) versus actual support is most relevant to the buffering effects seen in disease and behavior outcomes. This study used two plain language questions to assess levels of perceived social support for quitting or staying smoke-free and does not make assumptions about how respondents define

social support, but rather seeks information on respondents' belief or faith that support is available from friends and family. Future studies should conduct a more comprehensive assessment of social support among American Indian smokers in Minnesota. Specifically, investigating the types of social support and social network ties that would be helpful towards their efforts at smoking cessation.

Study Strengths

The data for this study came from the Tribal Tobacco Use Prevalence (TTUP) Study, the first statewide tobacco use prevalence survey of Minnesota American Indians to include a large sample size (statewide n= 2,926 and Hennepin and Ramsey Counties n= 964) of American Indians alone or in combination with other races. Another study strength is inclusion of culturally appropriate data collection methods such as differentiating between recreational/non-traditional tobacco use and ceremonial/sacred use and involvement of American Indian community members via community-based participatory research and reality-based research techniques. Third, RDS as a sample and survey collection methodology was a study strength in this population. No list-based sampling frame exists for American Indians in Hennepin and Ramsey Counties, therefore they are a "difficult-to-reach" population. Despite being somewhat inaccessible to investigators, this population is socially well connected and hence a perfect population to apply respondent-driven sampling methods.

Chapter 7. Conclusion

This study investigated the association between the presence of smoke-free policies, social support and cigarette smoking. McLeroy et al.'s (1988) Social Ecological Model (SEM) used as this study's conceptual framework has one critical assumption; a single-level intervention is unlikely to have powerful or sustained effects. The implication for this study is that in order to make notable, sustained changes in Minnesota's American Indian smoking rates, a multi-level, multi-sectoral approach is necessary. This includes interventions that address: (1) *intrapersonal factors* such as knowledge and perceived risk about cigarette smoking, secondhand smoke exposure, and adverse health outcomes and self-efficacy to seek information and help from others; (2) *interpersonal factors* such as social support from friends, family, elders, spiritual healers, and community members; (3) *organizational factors* such as promoting spiritual use of tobacco; (4) *community factors* such as denormalizing cigarette smoking in the community; and (5) *public policy approaches* such as implementing smoke-free rules in tribal buildings and tribal events.

Future studies should investigate the work environments of American Indians in Minnesota with respect to smoke-free policies and strategies for encouraging employers to implement and enforce complete smoking bans.

A timely opportunity exists to add all four intensive social support strategies discussed in this paper (existing network ties, new social linkages, indigenous natural helpers/community health workers, and community capacity building and problem-solving) with community specific needs [79-81; 145-151] to existing American Indian cessation programs. Programs need to address the historic and psychological trauma experienced by American Indian people in order to begin the healing process. Education on traditional tobacco and American Indian cultural and spiritual beliefs are critical pieces to maintaining traditional oral history across generations, while encouraging long-term smoking abstinence, and health promoting behaviors. Community strengths such as resiliency and personal experience coupled with the knowledge, emotional, and spiritual support that elders, spiritual leaders and other indigenous natural helpers can offer are

largely untapped resources, yet powerful agents of sustainable change.

Tables

Table 1. U.S. Census Bureau (2010) age and sex distribution. American Indian alone or in combination with one or more other race—Hennepin and Ramsey Counties, Minnesota.

	Hennepin County		Ramsey County		Age breakdown across counties, both sex
Age in years	Female N (%)	Male N (%)	Female N (%)	Male N (%)	N (%)
18-24	1,507 (8%)	1,138 (6%)	671 (3%)	581 (3%)	3,897 (20%)
25-34	1,928 (10%)	1,550 (8%)	781 (4%)	617 (3%)	4,876 (25%)
35-44	1,362 (7%)	1,196 (6%)	594 (3%)	496 (3%)	3,648 (19%)
45-54	1,267 (7%)	1,141 (6%)	588 (3%)	498 (3%)	3,494 (18%)
55-64	791 (4%)	693 (4%)	372 (2%)	283 (1%)	2,139 (11%)
65+	518 (3%)	239 (2%)	249 (1%)	168 (1%)	1,264 (7%)
Total	7,373 (38%)	6,047 (31%)	3,255 (17%)	2,643 (14%)	19,318 (100%)

Table 2. Study final sample available for the analysis. American Indian alone or in combination with one or more other race—Hennepin and Ramsey Counties, Minnesota (TTUP, 2011).

	Hennepin County		Ramsey County		Age breakdown across counties, both sex
Age in years	Female n (%)	Male n (%)	Female n (%)	Male n (%)	n (%)
18-24	101 (11%)	45 (5%)	15 (2%)	8 (1%)	169 (18%)
25-34	132 (14%)	79 (8%)	20 (2%)	14 (1%)	245 (26%)
35-44	92 (10%)	58 (6%)	18 (2%)	7 (1%)	175 (19%)
45-54	110 (12%)	66 (7%)	17 (2%)	3 (0.3%)	196 (21%)
55-64	52 (6%)	30 (3%)	15 (2%)	8 (1%)	105 (11%)
65+	23 (2%)	11 (1%)	11 (1%)	6 (1%)	51 (5%)
Total	510 (54%)	289 (31%)	96 (10%)	45 (5%)	940 (100%)

Table 3. Study final employed sample available for analysis. American Indian alone or in combination with one or more other race—Hennepin and Ramsey Counties, Minnesota (TTUP, 2011).

	Hennepin County		Ramsey County		Age breakdown across counties, both sex
Age in years	Female n (%)	Male n (%)	Female n (%)	Male n (%)	n (%)
18-24	15 (6%)	9 (4%)	7 (3%)	3 (1%)	34 (13%)
25-34	38 (15%)	26 (10%)	8 (3%)	5 (2%)	77 (30%)
35-44	49 (19%)	33 (13%)	12 (5%)	5 (2%)	99 (39%)
45-54	28 (11%)	8 (3%)	6 (2%)	5 (2%)	47 (18%)
55-64	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)
65+	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)
Total	130 (50%)	76 (30%)	33 (13%)	18 (7%)	257 (100%)

Table 4. Applying McLeroy et al (1988) Social Ecological Model to recreational cigarette smoking in the American Indian community.

Level	**Description**
Intrapersonal	Knowledge of the difference between recreational and ceremonial or sacred use of tobacco; perceived risk about recreational smoking, secondhand smoke exposure, and adverse health outcomes.
Interpersonal	Perceived social support from close family, friends, co-workers, and community members for quitting or staying smoke-free.
Organizational	Cigarette availability and tobacco company marketing tactics, tribal-based faith and culture organizations can promote traditional and sacred use of tobacco, while prohibiting recreational smoking from PowWows and other ceremonies and events.
Community	Cigarette smoking is viewed as a community social norm.
Public policy	Local, state, and federal cigarette taxes and regulations on smoking in workplaces and other indoor facilities (smoke-free policies) and home smoke-free rules encourage cessation. Tribal establishments exempt from state cigarette taxes and smoke-free indoor air laws hinder cessation.

Table 5. Model 1/Specific Aim 1—Variable definitions.

Variable name	Variable questions and response options from TTUP survey	Variable measures
Smoking status (outcome or dependent variable)	Q2/Not including ceremonial or sacred use, in your entire life have you ever smoked a cigarette, even one or two puffs? • Yes • No • Don't know/not sure • Refused Q4/ Not including ceremonial or sacred use, in your entire life have you smoked at least 100 cigarettes, about 5 packs? • Yes • No • Don't know/not sure • Refused Q6/Do you now smoke cigarettes every day, some days, or not at all? • Every day • Some days • Not at all • Don't know/not sure • Refused	Current smoker (1) Responded "yes" to Q2 and either: • Q4 = "yes" and Q6 = "every day" or "some days" • Q4 = "no" and Q6 = "every day or "some days" Former smoker (2) Responded "yes" to Q2 and "yes" to Q4 and "not at all" to Q6. Nonsmoker (3) Responded "no" to Q2 or "yes" to Q2 and "no" to Q4. Don't know/not sure or refused (4) Responded "don't know/not sure" or "refused" to Q2, Q4 and/or Q6. Missing/blank (999)
Workplace smoking policy (exposure or independent variable)	Q75/Which of the following best describes rules in the area where you work? Smoking in my work area is… • Allowed in all areas • Allowed in some areas • Not allowed at all • Don't know/not sure • Refused	Smoking allowed (1) Responded "allowed in all areas" or "allowed in some areas" to Q75. Smoking not allowed (2) Responded "not allowed at all" to Q75. Don't know/not sure or refused (3) Responded "don't know/not sure" or "refused" to Q75. Missing/blank (999)
Job location (possible confounder)	Q72/Is your primary job located on a reservation or off-reservation?	On reservation (1) Responded "on a reservation" or "both on and off a

Variable name	Variable questions and response options from TTUP survey	Variable measures
	• On a reservation • Off a reservation • Both on and off a reservation • Don't know/not sure • Refused	reservation" to Q72. <u>Not on a reservation (2)</u> Responded "off a reservation" to Q72. <u>Don't know/not sure or refused (3)</u> Responded "don't know/not sure" or "refused" to Q72. Missing/blank (999)
Number of jobs (possible confounder)	Q68/How many paid jobs do you currently have? • Zero or none • One paid job • Two paid jobs • Three or more paid jobs • Don't know/not sure • Refused	<u>One job (1)</u> Responded "one paid job" to Q68. <u>Two or more jobs (2)</u> Responded "two paid jobs" or "three or more paid jobs" to Q68. <u>Unemployed (3)</u> Responded "zero or none" to Q68. <u>Don't know/not sure or refused (4)</u> Responded "don't know/not sure" or "refused" to Q68. Missing/blank (999)
Work setting (possible confounder)	Q73/What best describes your current primary job's worksite? Is it a… • Airport • Bank • Bar • Casino • Clinic • Entertainment (arcade, movie) • Home (yours) • Home (someone else's) • Hospital or emergency room • Hotel, motel or lodge	<u>Indoors (1)</u> Responded "airport," "bank," "bar," "casino," "clinic," "entertainment (arcade, movie)," "home (yours)," "home (someone else's)," "hospital or emergency room," "hotel, motel or lodge," "library or museum," "office," "plant, factory or warehouse," "restaurant (serves alcohol)," "restaurant (no alcohol)," "school," "store (gas or convenience)," "store (other retail, mall)," or

Variable name	Variable questions and response options from TTUP survey	Variable measures
	• Library or museum • Office • Outside, such as construction, fishing or lawn care • Plant, factory or warehouse • Restaurant (serves alcohol) • Restaurant (no alcohol) • School • Store (gas or convenience) • Store (other retail, mall) • Vehicle • Some other setting • Don't know/not sure • Refused	"vehicle." <u>Outdoors (2)</u> Responded "outside, such as construction, fishing or lawn care." to Q73. <u>Don't' know/not sure or refused (3)</u> Responded "don't know/not sure" or "refused" to Q73. Missing/blank (999)

Table 6. Model 2/Specific Aim 2—Variable definitions.

Variable name	Variable questions and response options from TTUP survey	Variable measures
Smoking status (outcome or dependent variable)	Q2/Not including ceremonial or sacred use, in your entire life have you ever smoked a cigarette, even one or two puffs? • Yes • No • Don't know/not sure • Refused Q4/ Not including ceremonial or sacred use, in your entire life have you smoked at least 100 cigarettes, about 5 packs? • Yes • No • Don't know/not sure • Refused Q6/Do you now smoke cigarettes every day, some days, or not at all? • Every day • Some days • Not at all • Don't know/not sure • Refused	<u>Current smoker (1)</u> Responded "yes" to Q2 and either: • Q4 = "yes" and Q6 = "every day" or "some days" • Q4 = "no" and Q6 = "every day or "some days" <u>Former smoker (2)</u> Responded "yes" to Q2 and "yes" to Q4 and "not at all" to Q6. <u>Nonsmoker (3)</u> Responded "no" to Q2 or "yes" to Q2 and "no" to Q4. <u>Don't know/not sure or refused</u> (4) Responded "don't know/not sure" or "refused" to Q2, Q4 and/or Q6. Missing/blank (999)

Perceived social support (exposure or independent variable)	Q18 [current]/How much support do you think you have among your friends and family for quitting smoking? • None • A little • Some • Quite a bit or a lot • Don't know/not sure • Refused Q37 [former and non]/How much support do you think you have among your friends and family for staying smoke-free? • None • A little or some • Quite a bit • A lot • Don't know/not sure • Refused	<u>None (1)</u> Responded to "none" to Q18 or Q37. <u>A little or some (2)</u> Responded "a little" to Q18 or "a little or some" to Q37. <u>Quite a bit or a lot (3)</u> Responded "quite a bit or a lot" to Q18 or "quite a bit" or "a lot" to Q37. <u>Don't know/not sure or refused (4)</u> Responded "don't know/not sure" or "refused" to Q18 or Q37. Missing/blank (999)
Age (possible confounder)	Q115/What is your age? • 18 to 24 yrs. • 25 to 29 yrs. • 30 to 34 yrs. • 35 to 44 yrs. • 45 to 54 yrs. • 55 to 64 yrs. • 65+ yrs. • Don't know/not sure • Refused	<u>18 to 24 yrs. (1)</u> Responded "18 to 24 yrs." to Q115. <u>25 to 34 yrs. (2)</u> Responded "25 to 29" or "30 to 34" to Q115. 35 to 44 yrs. (3) Responded "35 to 44 yrs." to Q115. <u>45 to 54 yrs. (4)</u> Responded "45 to 54 yrs." to Q115. <u>55+ yrs. (5)</u> Responded "55 to 64 yrs." or "65+ yrs." to Q115. <u>Don't' know/not sure or refused (6)</u> Responded "don't' know/not sure" or "refused" to Q115. Missing/blank (999)

Sex (possible confounder)	Q116/Check box appropriate for participant [do not read categories] • Male • Female • Don't know/not sure • Refused	Male (1) Responded "male" to Q116. Female (2) Responded "female" to Q116. Don't know/not sure or refused (3) Responded "don't know/not sure" or "refused" to Q116. Missing/blank (999)

Education (possible confounder)	Q128/What is the highest level of school you completed or the highest degree you received? • Never attended high school • Some high school • High school graduate • GED • Some college, no degree • Completed a technical or certificate program • Two-year degree • Four-year degree • Some graduate or professional school • Graduate or professional degree • Don't know/not sure • Refused	<u>Never attended high school/some high school (1)</u> Responded "never attended high school or "some high school" to Q128. <u>High school graduate (2)</u> Responded "high school graduate" to Q128. <u>General Educational Development (GED) (3)</u> Responded "GED" to Q128. <u>Some college (4)</u> Responded "some college, no degree" to Q128. <u>Technical or certificate program/two-year degree (5)</u> Responded "completed a technical or certificate program" or "two-year degree" to Q128. <u>Four year degree and beyond (6)</u> Responded "four-year degree," or "some graduate or professional school," or "graduate or professional degree" to Q128. <u>Don't' know/not sure or refused (7)</u> Responded "don't' know/not sure" or "refused" to Q128. Missing/blank (999)

Children in home (possible confounder)	Q118/How many children aged 17 or younger live in your household? • 0 • 1 • 2 • 3 • 4 • 5 • 6+ • Don't know/not sure • Refused	<u>No children (1)</u> Responded "0" to Q118. <u>At least one child (2)</u> Responded "1," "2," "3," "4," "5," or "6+," to Q118. <u>Don't' know/not sure or refused (3)</u> Responded "don't know/not sure" or "refused" to Q118. Missing/blank (999)
Smoker contacts (possible confounder)	Q121/Not including ceremonial or sacred use, and not including yourself, how many of the people who live in your household smoke cigarettes, cigars, or pipes? • 0 • 1 • 2 • 3 • 4 • 5 • 6 • 7+ • Don't know/not sure • Refused	<u>No smokers (1)</u> Responded "0" to Q121. <u>At least one smoker (2)</u> Responded "1," "2," "3," "4," "5," "6,"or "7+" to Q121. <u>Don't know/not sure or refused (3)</u> Responded "don't know/not sure" or "refused" to Q121. Missing/blank (999)
Home smoke-free rule (possible confounder)	Q65/What rules do you have about smoking inside your home? Would you say smoking is allowed… • Allowed everywhere and at anytime inside your home • Allowed in some places or at some times inside your home • Not allowed anywhere or at any time inside your home • Don't know/not sure • Refused	<u>Smoking allowed (1)</u> Responded "allowed everywhere and anytime inside your home" or "allowed in some places or at some times inside your home" to Q65 <u>Smoking not allowed (2)</u> Responded "not allowed anywhere or at any time inside your home" to Q65. <u>Don't know/not sure or refused (4)</u> Responded "don't' know/not sure" or "refused" to Q65. Missing/blank (999)

Figures

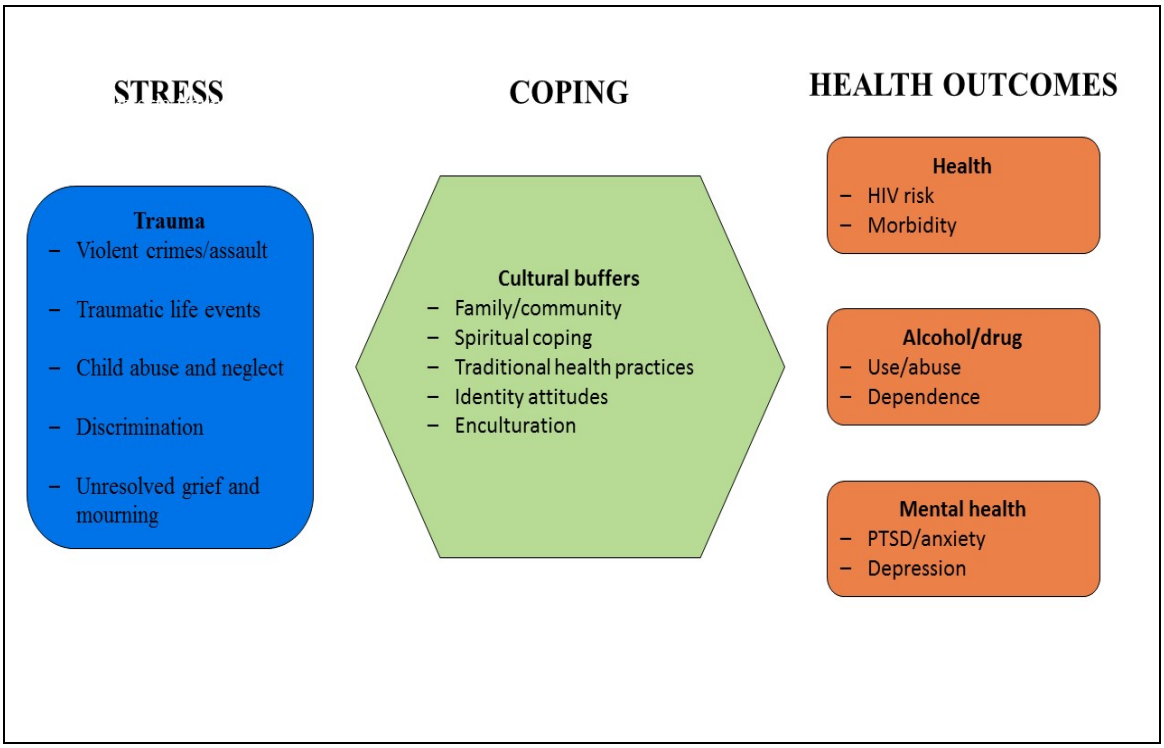

Figure 1. Indigenous Stress and Coping Model. Note: PTSD = post-traumatic stress disorder. Reprinted with permission from "Substance Use Among American Indians and Alaska Natives: Incorporating Culture in an 'Indigenist' Stress and Coping Paradigm," by Walters, Simoni, and Evans-Campbell, 2002, Public Health Reports, 117(1), S104-107. © 2002 by Katrina L. Walters.

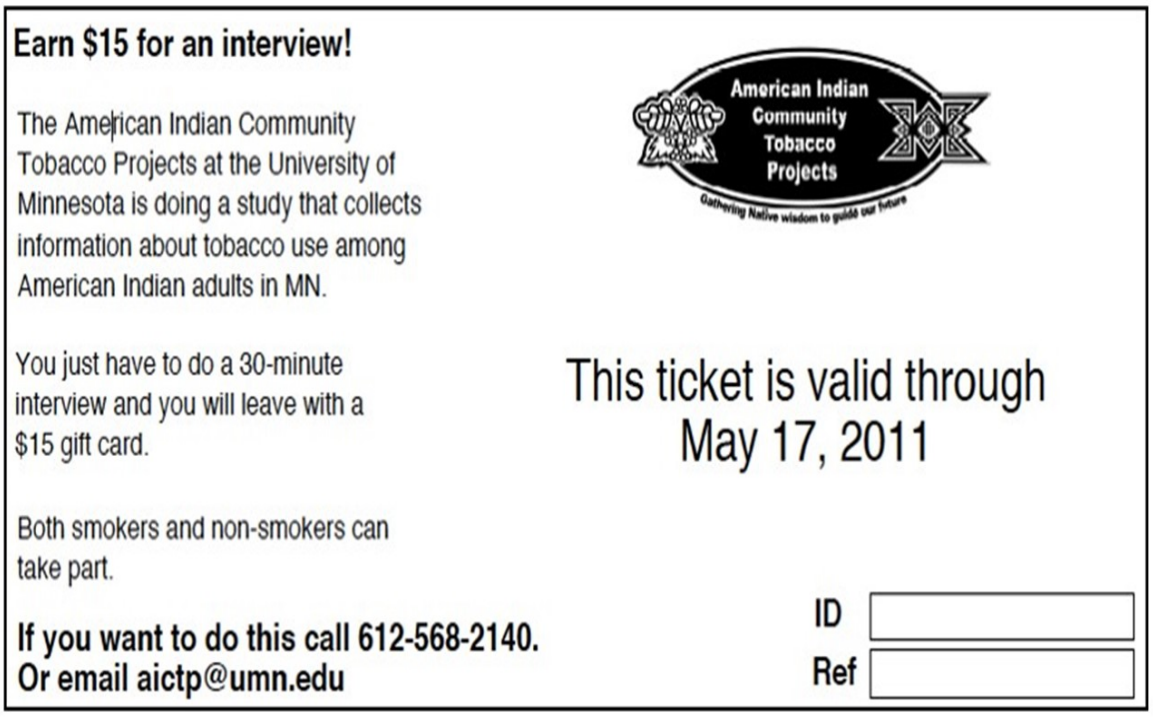

Figure 2. American Indian Tobacco Survey coupons. The Tribal Tobacco Use Prevalence Study used respondent-driven sampling in Hennepin and Ramsey Counties, Minnesota. Using this method, five initial survey respondents known as "seeds" received a $15 gift card for participation in the survey and three coupons to distribute to individuals in their social network. Unique ids linked the recruiter to recruits, which were used to create network weights important for reducing bias introduced by the respondent-driven sampling method.

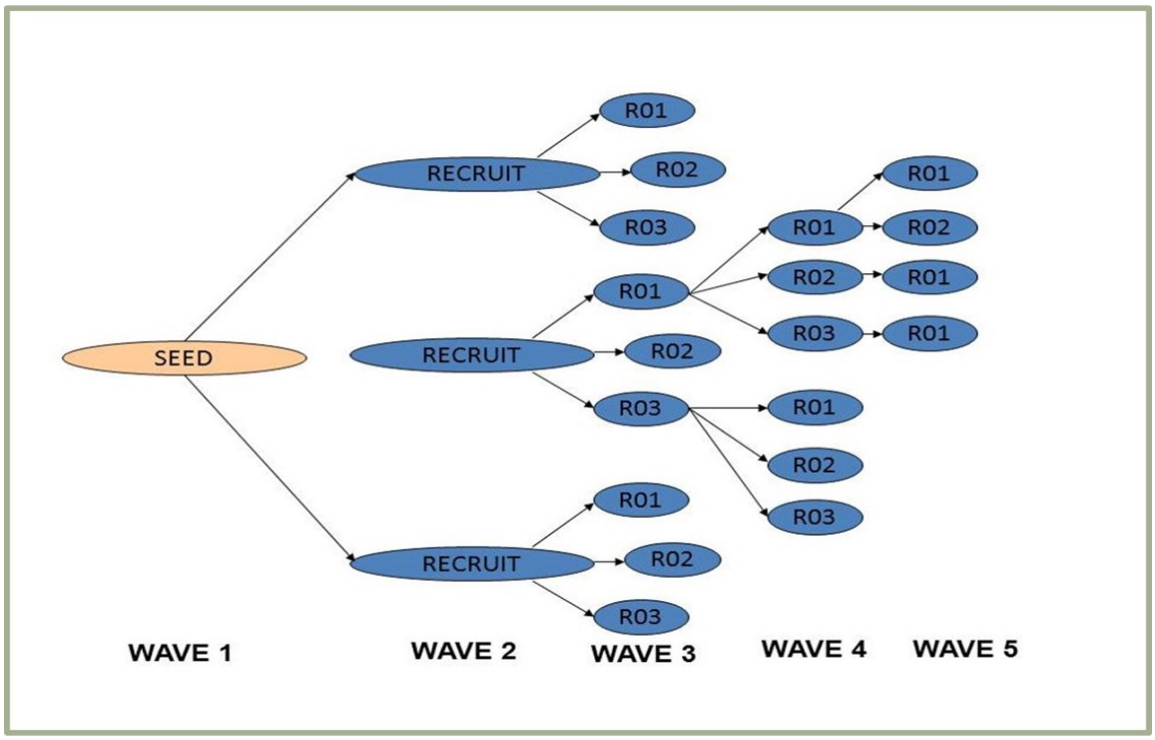

Figure 3. Respondent-driven sampling recruitment process. Initial recruits known as "seeds" participate in the survey (Wave 1) and recruit three survey eligible individuals from their social network who return to take the survey (Wave 2). With each new wave, the recruitment tree expands outwards until saturation, the goal sample size is achieved.

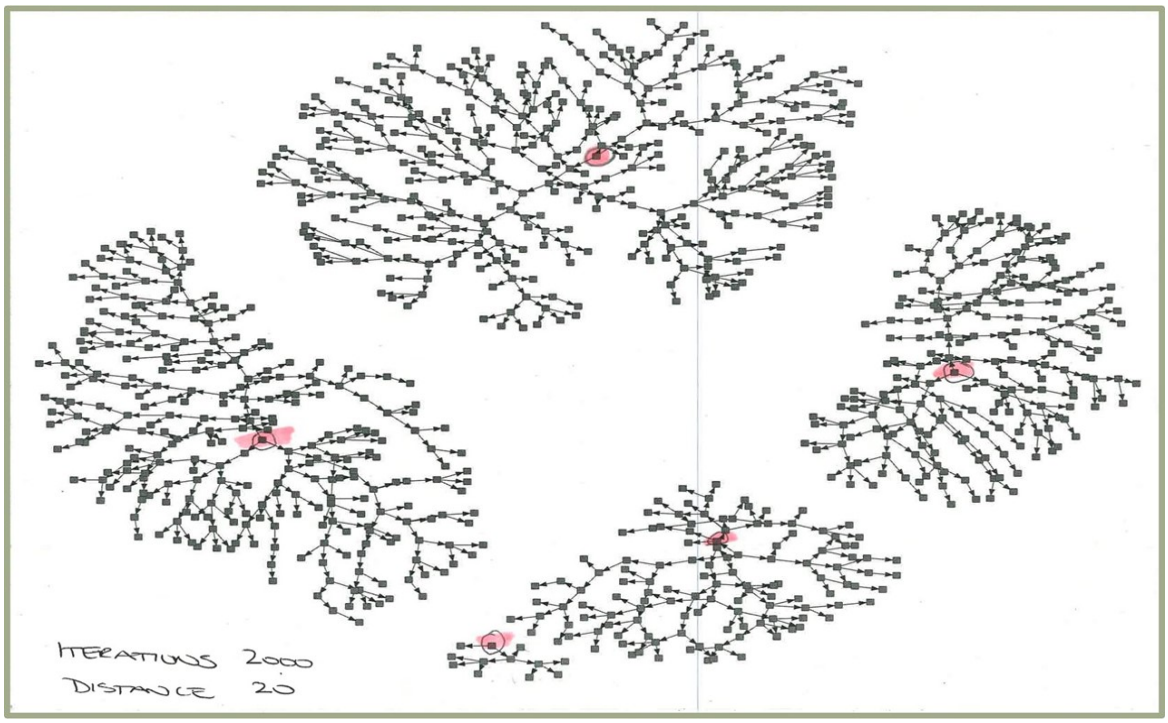

Figure 4. Example respondent-driven sampling recruitment trees. This figure captures a portion of the total recruitment through 2,000 iterations. The highlighted points represent the five initial recruits also known as "seeds." As each new recruit participated in the survey and recruited up to three other participants, the recruitment tree grew outwards.

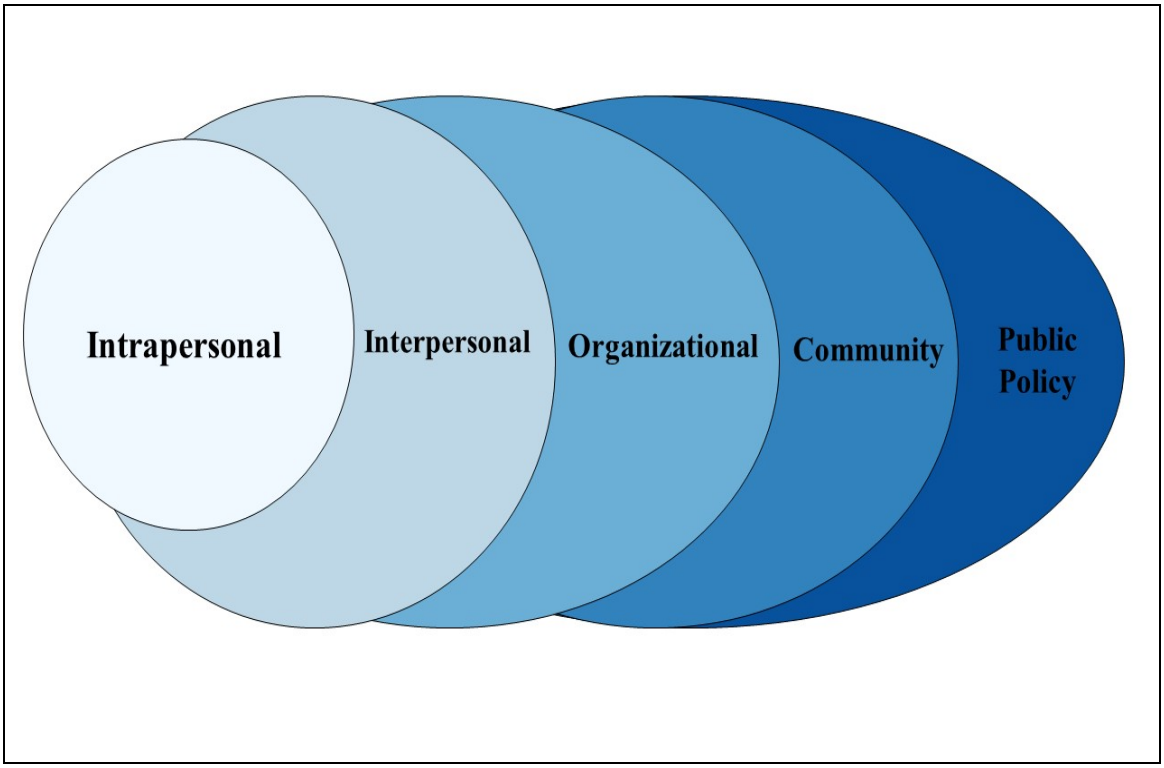

Figure 5. Social Ecological Model. Reprinted with permission from "An ecological perspective on health promotion programs," by McLeroy, Bilbeau, Steckler, and Glanz, 1988, Health Education Quarterly, 15(4), 351-71. © 1988 by KR McLeroy.

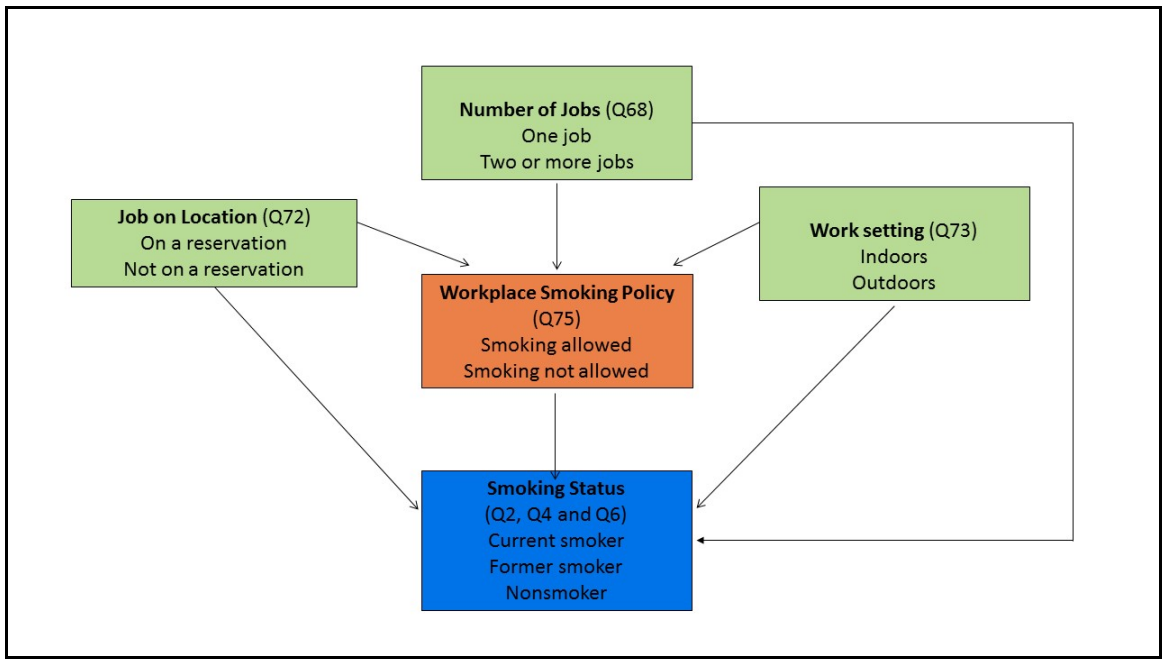

Figure 6. Causal Model 1/Specific Aim 1—Directed Acyclic Graph of Workplace Smoking Policy and Current Smoking. Description: Specific Aim 1 investigates the relationship between the presence of a workplace smoke-free policy and smoking status (outcome or dependent variable).

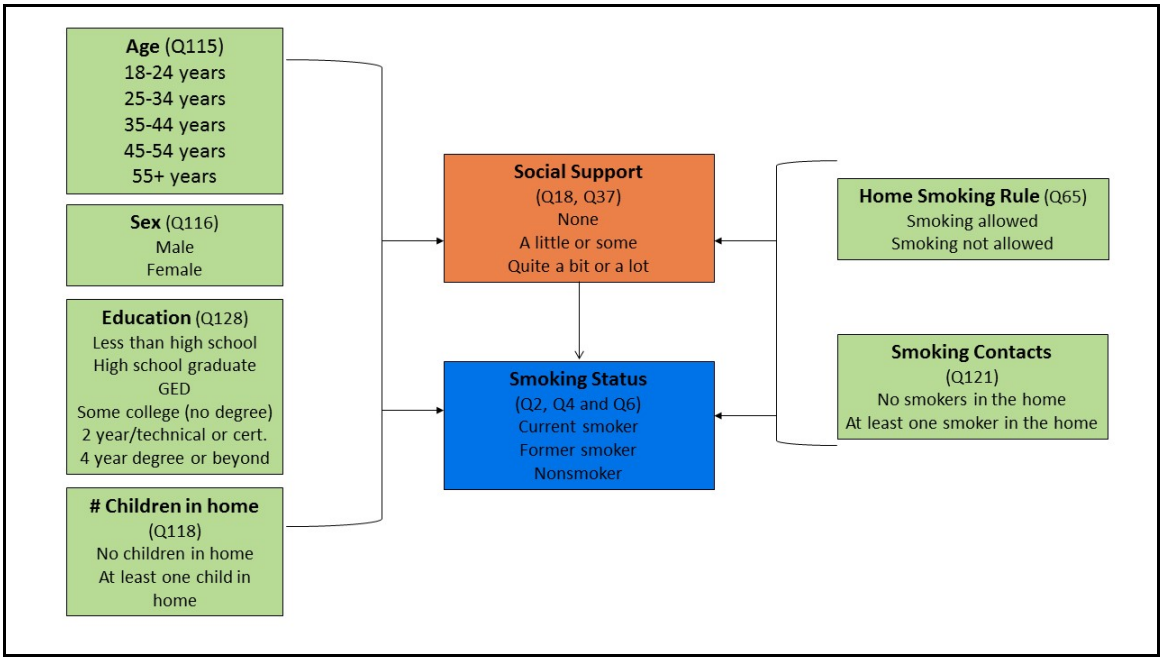

Figure 7. Causal Model 2/Specific Aim 2—Directed Acyclic Graph of Social Support and Current Smoking. Description: Specific Aim 2 investigates the relationship between social support (exposure or independent variable) and smoking status (outcome or dependent variable).

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Appendices

Appendix 1. Summary of Respondent Driven Sampling

In population-based surveys when a sampling frame is non-existent or infeasible (e.g. the population is small relative to the general population, geographically dispersed, membership involves stigma or the group has networks that are difficult for others to penetrate) it is necessary to collect a non-probability sample and determine ways to reduce bias [163]. One such promising method, respondent-driven sampling (RDS) [100], is an evolution of Coleman (1958-1959) and Goodman's (1961) snowball or chain-referral sampling used in the study of social network structures. It was developed by Heckathorn (1997) as part of an AIDS prevention intervention, the Eastern Connecticut Health Outreach (ECHO) project. RDS was used to recruit participants into ECHO and sample the population of active injection drug users. It has since been used in over 120 studies of hard-to-reach populations in dozens of countries [165] including migrants, jazz musicians, and child prostitutes [166].

In RDS, investigators recruit an *a priori* number of known group members called "seeds" in Wave 1 of recruitment. Seeds are asked to recruit an *a priori* number of other known group members. Recruits that return to participate in the survey are known as "alters." This process continues through subsequent waves until a desired sample size has been reached [100].

RDS is a potentially superior non-probability sampling method for capturing inaccessible populations since it accounts for many of the limitations and biases associated with snowball or other forms of chain-referral sampling [166-168].

Small sample sizes: finding respondents, and starting and maintaining referral chains

Locating people who maintain low visibility due to their illegal activities and behaviors or actions that may be subject to perceived stigma or discrimination may be difficult in snowball and other forms of chain-referral sampling including RDS. Examples include illicit drug users or dealers, illegal immigrants, and people with

sexually transmitted diseases. Others are difficult or hard-to-reach due to small numbers or geographic dispersion. However, there are strategies to resolve this issue such as identifying key points of contact (e.g. social workers, health professionals, trusted organizations, or locations frequented by the target population). However, once identified, snowball and other forms of chain referral sampling have difficulties maintaining referral chains and reaching a sufficient sample size. Chains are more apt to terminate early due to respondent attrition. This can occur through masking [166], where recruits do not wish to disclose the identity of other group members, due to illegal or stigmatized behaviors or due to use of a linear recruitment chain such as Klovadahl's (1989) random walk approach. Masking bias can be reduced in any chain-referral method by developing trust between investigators and the study population. Recruits are more willing to recruit alters when investigators conduct the study in a safe environment and hold all study participants' names confidential.

RDS minimizes attrition with incentives and non-linear recruitment chains. First, RDS uses a dual-incentive system. Seeds and participants are offered a financial incentive for taking a survey and additional incentives for each alter they recruit who returns to take the survey. Monetary incentives (primary incentive) and peer pressure (secondary incentive) drive recruitment. Second, RDS starts with more than one seed (usually 5) and multiple referral quota (usually 3), which forms a tree-shaped recruitment network that decreases the probability of early chain termination.

Verifying the eligibility of potential respondents

Only group members of the target population are sampled in snowball, chain referral, or RDS. Verification of respondents' eligibility for inclusion in the sample may be difficult in any of the three methods. Strategies for verifying eligibility include via third-party sources [169-170] or using a valid and reliable screening protocol [100].

Repeat survey participation

Repeat participation can be a problem in survey data collected through snowball sampling and other chain-referral methods. This can occur if respondents cannot recall

previous participation in the survey, an individual who impersonates an alter and later is recruited to participate, or those who seek to take the survey multiple times when there is monetary gain. RDS minimizes this issue through tracking survey participants. Investigators provide each participant a limited number of coupons with unique ids to recruit alters. Once alters return to participate in the survey, the investigators or interviewers collect the unique coupons and log them into a database. This strategy also prevents walk-ins (i.e. individuals who go to the interview site without being recruited from the study network and permits investigators to link a recruit to alters and track important demographics for network analysis.

Selection bias, network bias, and difficulty generating a representative sample

In snowball sampling and other chain-referral methods, the original selection of seeds may bias the overall sample generated as explained by biased network theory [171-172]. According to this theory, a structured social system's social linkages will be non-random, i.e. some relationships will be more probable than other relationships. "Bias" refers to any deviation from a fully random pattern of connection [100], either due to in-group affiliation (also known as inbreeding bias or homophily) (e.g. same sex, age, county of residence, and smoking status) or out-group affiliation (also known as heterophily) (e.g. different sex, age, county of residence, and smoking status). Seeds and corresponding recruit's differential magnitude of homophily or heterophily, network size, and ability to successfully recruit alters into a study can bias the overall representativeness of the sample [100].

Analyses of the RDS peer recruitment process shows that it follows a first-order Markov process. As the sample expands through each wave of recruitment it approaches an equilibrium that is independent of the convenience sample of seeds from which the sampling starts [100, 129]. Hence, Heckathorn (1997, 2002) demonstrates that a nonrandom selection of initial seeds may not bias the overall sample if there is a sufficiently large number of recruitment waves. Heckathorn (1997, 2002) states that even when homophily or heterophily is uneven among seed recruitment, large sample sizes of

about 1,000 collected through six or more waves of recruitment diminishes inbreeding bias. When feasible, inbreeding bias can be corrected through weighting on known group characteristics of the population, i.e. Census data.

Assumptions of RDS Methodology

There are six underlying assumptions of the RDS methodology [130].

1. Respondents know one another as members of the target population.
2. The network of the target population forms a single component. This occurs when the network is created through a contact pattern, has small-world properties, or if its network size fit a power-law distribution.
3. Sampling occurs with replacement. Therefore, the sampling fraction must be small enough for a sampling-with-replacement model to be appropriate.
4. Respondents can accurately report their personal network size, i.e., the number of individuals they know who fit the study inclusion criteria.
5. Respondents recruit randomly from their personal networks. This assumption becomes more plausible when members of the target population have easy and nonthreatening access to the research sites.
6. Respondents recruit only a single alter, so recruitment effectiveness is uniform across groups.

Heckathorn (2011) states that the first five assumptions provide guidance on both when RDS is an appropriate method and on suitable research designs. The sixth assumption is frequently counterfactual, because it is common for some groups to recruit more effectively than others due to having larger social network ties and/or they are more efficient at recruiting alters to participate in the study. However, Salganik and Heckathorn (1994) have developed a weighting method to decrease bias from differences in participant network size. These mathematical algorithms are included in the online RDS Analysis Tool, which applies Markov Chain Theory and Monte Carlo bootstrapping techniques to adjust for differential network size [132].

Criticisms of RDS

RDS has been increasing as a sampling strategy in the published literature. Between 1997-2005, there were 19 publications and by 2011-2012, the number of publications was almost ten-fold (173 publications). Decker and Ramachandran (n.d.) notes that researchers using RDS as a preferred methodology have found positive results, mainly that those recruited are more likely to be eligible; the process can be faster and at times, more cost-effective method of sampling; and it is effective at reaching more invisible, marginalized sub-populations (e.g. migrants, jazz musicians, child prostitutes). However, RDS is still a controversial methodology. One study reported RDS estimates that were biased with unreliable confidence intervals despite applying RDS network weights [168]. Other studies using RDS found difficulty in recruiting adequate samples when social networks were weak in the population of interest [173] or failed to expose additional members of marginalized groups [174]. Arguments against these criticisms claim that RDS fails when researchers do not properly apply the methodology [131] or do not collect *a priori* formative research on the population of interest [175].

Respondent Driven Sampling (RDS) Recruitment

The target sample size for this study was 1,000 participants, based on detectable differences in smoking rates by demographic categories. Application of RDS started with TTUP Study team recruitment of five initial participants (seeds) and resulted in 964 total surveys from 12 waves of recruitment over a 9-week span: March 24, 2011 through May 31, 2011. Of the total sample, 940 surveys had full demographic information used to investigate Specific Aims 1 and 2 of the dissertation, and 775 surveys had unique identification numbers linking recruit to alter used to analyze recruitment success described in this technical appendix.

Overall, half of survey participants were successful at recruiting at least one person from their network. Twenty-four percent of participants successfully recruited all three maximum quota from their network (see **Figure A1, Table A1**).

All 5 seeds recruited people into the study, with four seeds recruiting three alters and 1 seed recruiting 2 alters. The total number of recruits originating from each seed ranged from 12 to 316 (2% to 41 % of the sample with recorded identification numbers) (see **Figure A2, Table A2**).

Records with specific identification numbers for 775 survey participants were available for analysis of recruitment success. Of these, Seed 2 produced 41% of participants, followed by Seed 5 (27%), Seed 1 (19%), Seed 3 (11%), and Seed 4 (2%). Seed 4 had the lowest recruitment success with complete termination of the recruitment tree by Wave 4. The highest recruitment occurred in Wave 8 (15% of all alters with analyzable surveys, excluding seeds) (see **Figure A3, Table A3**).

The total number of recruits (seeds plus alters) who participated in the survey was 964, and the total number of non-recruits or those who either did not return to take the survey or were not recruited was 1,696. The response rate by wave (excluding seeds) ranged from 19% to 93% (see **Figure A4, Table A4**). The overall response rate was 36%, substantially lower than the 50% observed in other RDS studies [162, 176].

Homophily (H_x) is a measure of within group recruitment and assigned a value of +1, 0, or -1. A value of +1 indicates complete homphily, where the recruiter always recruits an alter from within their group demographic (i.e. county of residence, sex, age, or smoking status). A value of zero indicates recruitment without regard to group membership. A value of -1 indicates complete heterophily or out group recruitment where the recruiter always recruits an alter outside their group type.

Homophily by County of Residence

Hennepin County residents were more likely to recruit Hennepin County residents than Ramsey County residents ($S_{H\text{-}H} = 0.939$ and $S_{H\text{-}R} = 0.061$). Likewise, Ramsey County residents were more likely to recruit other Ramsey County residents than Hennepin County residents ($S_{R\text{-}R} = 0.592$ and $S_{R\text{-}H} = 0.408$) (see **Table A5**). *Homophily by Sex:* Females and males were more likely to recruit females than males ($S_{f\text{-}f} = 0.671$ and $S_{m\text{-}f} = 0.58$ versus $S_{f\text{-}m} = 0.329$ and $S_{m\text{-}f} = 0.42$, respectively) (see **Table A6**).

Homophily by Age

Adults 18 to 24 years were more likely to recruit within their same age group (S_{18-24} = 0.295) and 45 to 54 year olds (S_{45-54} = 0.223) than other age groups (S_{25-29} = 0.173, S_{30-34}= 0.079, S_{35-44}= 0.144, S_{55-64}= 0.065, S_{65+}= 0.022). Adults 25 to 29 years were more likely to recruit 45 to 54 year olds (S_{45-54} = 0.215) than other age groups (S_{18-24} = 0.194, S_{25-29} = 0.194, S_{30-34}= 0.111, S_{35-44}= 0.187, S_{55-64}= 0.083, S_{65+}= 0.014). Adults 30 to 34 years were more likely to recruit 18 to 24 year olds (S_{18-24} = 0.208) and 35 to 44 year olds (S_{35-44}= 0.208) than other age groups (S_{25-29} = 0.109, S_{30-34}= 0.158, S_{45-54} = 0.178, S_{55-64}= 0.079, S_{65+} = 0.059). Adults 35 to 44 years were more likely to recruit within their same age group (S_{35-44}= 0.217) and one age group older (S_{45-54} = 0.233) than other age groups (S_{18-24} = 0.15, S_{25-29} = 0.133, S_{30-34}= 0.144, S_{55-64}= 0.089, and S_{65+} = 0.033).

Adults ages 45 to 54 years were more likely to recruit within their same age group (S_{45-54} = 0.211) than other age groups (S_{18-24} = 0.167, S_{25-29} = 0.127, S_{30-34}= 0.127, S_{35-44}= 0.197, S_{55-64}= 0.127, and S_{65+} = 0.044). Adults ages 55 to 64 years were more likely to recruit within their same age group (S_{55-64}= 0.20) and one age group younger (S_{45-54} = 0.21) than other age groups (S_{18-24} = 0.152, S_{25-29} = 0.114, S_{30-34}= 0.095, S_{35-44}= 0.162, and S_{65+} = 0.067). Older adults 65+ years were more likely to recruit within their same age group (S_{65+} = 0.273) than other age groups (S_{18-24} = 0.018, S_{25-29} = 0.145, S_{30-34}= 0.073, S_{35-44}= 0.164, S_{45-54}= 0.145, and S_{55-64}= 0.182) (see **Table A7**).

Homophily by Smoking Status

Current smokers and non-smokers were more likely to recruit current smokers than non-smokers (S_{c-c} = 0.686 and S_{n-c} = 0.594 versus S_{c-n} = 0.314 and S_{n-n} = 0.406, respectively) (see **Table A8**).

Appendix 1. Tables

Table A1. Number of recruits per wave.

Wave	Recruit 0	Recruit 1	Recruit 2	Recruit 3
1 (seeds)	n/a	n/a	n/a	n/a
2	0	0	1	4
3	1	3	3	7
4	7	2	5	16
5	24	8	8	19
6	38	13	10	21
7	58	18	9	20
8	40	18	11	22
9	56	18	12	15
10	51	6	11	20
11	41	6	9	10
12	28	3	6	15

Table A2. Total number of recruits by seed.

Seeds	Cumulative individuals successfully recruited, n (%)
1	144 (19%)
2	316 (41%)
3	88 (11%)
4	12 (2%)
5	215 (27%)
Total	775 of analyzable surveys

Table A3. Total recruitment by wave.

Wave	Survey respondents, n (%)
1 (seeds)	5
2	14 (2%)
3	30 (3%)
4	64 (7%)
5	98 (11%)
6	127 (14%)
7	118 (13%)
8	136 (15%)
9	126 (14%)
10	101 (11%)
11	58 (6%)
12	63 (7%)
Total analyzable surveys (940) – Seeds (5):	935

Table A4. Response rate by wave

Wave	TTUP recruits n = 940 analyzable (out of 964)	TTUP Nonrecruits N= 1,696	TTUP cumulative analyzable sample N = 940	Response rate (36%)
1 (seeds)	5	0	5	n/a
2	14	1	19	94%
3	30	12	49	71%
4	64	26	113	71%
5	98	94	211	51%
6	127	167	338	43%
7	118	263	456	31%
8	136	218	592	38%
9	126	282	718	31%
10	101	277	819	27%
11	58	245	877	19%
12	63	111	940	36%

Table A5. RDS sample homophily by county of residence.

	County of recruit (alter)	
County of recruiter	Hennepin	Ramsey
Hennepin:		
Recruitment count	733	48
Selection proportion, S	0.94	0.06
Demographically adjusted count	756.98	49.6
Data-smoothed count	756.98	49.6
Data-smoothed proportion	0.94	0.06
Ramsey:		
Recruitment count	60	87
Selection proportion, S	0.41	0.59
Demographically adjusted count	49.6	71.9
Data-smoothed count	49.6	71.9
Data-smoothed proportion	0.41	0.59
Total:		
Recruitment count	793	135
Estimated population proportions (95% CI)	0.89 (0.85-0.92)	0.11 (0.08-0.15)
Sample population proportions	0.85	0.15
Recruitment proportions	0.86	0.15
Equilibrium sample distribution	0.87	0.13
Mean network size, N (adjusted)	7.46	9.10
Mean network size, N (unadjusted)	108.41	189.60
Homophily, (Hx)	0.44	0.54
Affiliation homophily, (Ha)	0.53	0.53
Degree homophily, (Hd)	-0.02	0.03
Population weights	1.05	0.73
Recruitment component, (RCx)	1.02	0.87
Degree component, (DCx)	1.02	0.84
Standard error of P	0.02	0.02

Table A6. RDS sample homophly by sex.

	Sex of recruit (alter)	
Sex of recruiter	Female	Male
Female:		
Recruitment count	426	209
Selection proportion, S	0.67	0.33
Demographically adjusted count	405.43	198.87
Data-smoothed count	405.34	198.87
Data-smoothed proportion	0.67	0.33
Male:		
Recruitment count	181	131
Selection proportion, S	0.58	0.42
Demographically adjusted count	198.87	143.93
Data-smoothed count	198.87	143.93
Data-smoothed proportion	0.58	0.42
Total:		
Recruitment count	607	340
Estimated population proportions (95% CI)	0.63 (0.59, 0.66)	0.34 (0.34, 0.41)
Sample population proportions	0.64	0.36
Recruitment proportions	0.64	0.36
Equilibrium sample distribution	0.64	0.36
Mean network size, N (adjusted)	7.81	7.34
Mean network size, N (unadjusted)	129.69	100.60
Homophily, (Hx)	0.12	0.07
Affiliation homophily, (Ha)	0.09	0.09
Degree homophily, (Hd)	0.04	-0.04
Population weights	0.10	1.05
Recruitment component, (RCx)	0.10	1.01
Degree component, (DCx)	0.98	1.04
Standard error of P	0.02	0.02

Table A7. RDS sample homophily by age.

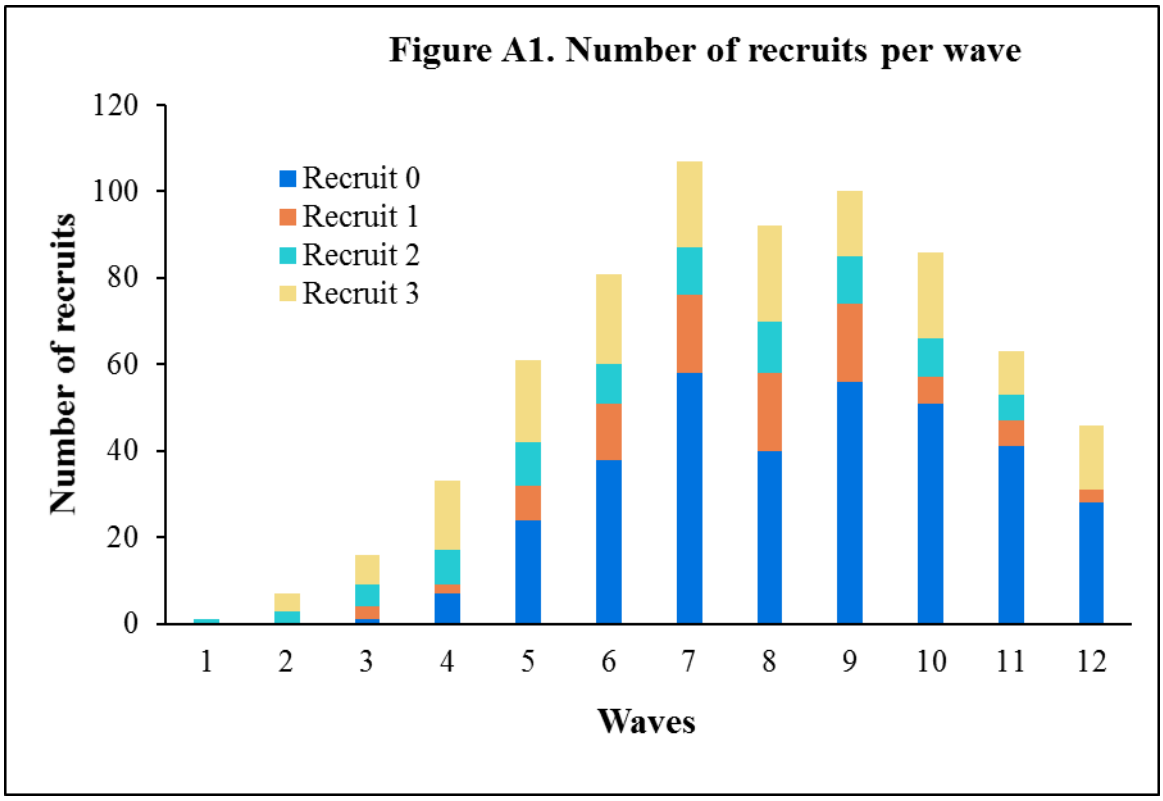
	Age of recruit (years) (alter)						
Age of recruiter (years)	18-24	25-29	30-34	35-44	45-54	55-64	65+
18-24:							
Recruitment count	41	24	11	20	31	9	3
Selection proportion, S	0.30	0.17	0.08	0.14	0.22	0.07	0.02
Demographically adjusted count	52.70	30.85	14.14	24.71	39.85	11.57	3.86
Data-smoothed count	52.70	28.76	18.61	20.08	36.64	13.54	2.35
Data-smoothed proportion	0.30	0.16	0.10	0.15	0.21	0.08	0.01
25-29:							
Recruitment count	28	28	16	27	31	12	2
Selection proportion, S	0.19	0.19	0.11	0.19	0.22	0.08	0.01
Demographically adjusted count	26.64	26.62	15.22	25.69	29.50	11.42	1.90
Data-smoothed count	28.75	26.64	113.65	24.60	27.51	11.53	4.33
Data-smoothed proportion	0.21	0.19	0.10	0.18	0.20	0.08	0.03
30-34:							
Recruitment count	21	11	16	21	18	8	6
Selection proportion, S	0.21	0.11	0.16	0.21	0.18	0.08	0.06
Demographically adjusted count	23.08	12.10	17.59	23.08	19.79	8.80	6.60
Data-smoothed count	18.61	13.66	17.59	24.28	22.65	9.24	4.99
Data-smoothed proportion	0.17	0.12	0.16	0.22	0.20	0.08	0.05
35-44:							
Recruitment count	27	24	26	39	42	16	6
Selection proportion, S	0.15	0.13	0.15	0.22	0.23	0.09	0.03
Demographically adjusted count	26.46	23.52	25.48	38.22	41.16	15.68	5.88
Data-smoothed count	26.08	26.60	24.28	38.22	40.38	16.08	6.74
Data-smoothed proportion	0.15	0.14	0.14	0.22	0.23	0.09	0.04
45-54:							
Recruitment count	38	29	29	45	48	29	10
Selection proportion, S	0.17	0.13	0.13	0.20	0.21	0.13	0.04
Demographically adjusted count	33.44	25.52	25.52	39.60	42.23	25.52	8.80
Data-smoothed count	36.64	27.51	22.66	40.40	42.23	23.42	7.78
Data-smoothed proportion	0.18	0.14	0.11	0.20	0.21	0.11	0.04
55-64:							
Recruitment count	16	12	10	17	22	21	7
Selection proportion, S	0.15	0.11	0.10	0.16	0.21	0.20	0.07
Demographically	15.51	11.63	9.69	16.48	21.33	20.36	6.79

	Age of recruit (years) (alter)						
Age of recruiter (years)	18-24	25-29	30-34	35-44	45-54	55-64	65+
adjusted count							
Data-smoothed count	13.54	11.53	9.24	16.08	23.42	20.36	7.62
Data-smoothed proportion	0.13	0.11	0.09	0.16	0.23	0.20	0.08
65+:							
Recruitment count	1	9	4	0	9	1	15
Selection proportion, S	0.02	0.15	0.07	0.16	0.15	0.18	0.27
Demographically adjusted count	0.85	6.76	3.38	7.61	6.76	8.46	12.68
Data-smoothed count	2.35	4.33	5.00	6.74	7.78	7.62	12.68
Data-smoothed proportion	0.05	0.09	0.11	0.12	0.17	0.16	0.27
Total:							
Recruitment count	172	136	112	178	100	105	49
Estimated population proportions (95% CI)	0.20 (0.17-0.23)	0.10 (0.08-0.12)	0.10 (0.08-0.12)	0.22 (0.18-0.25)	0.21 (0.18-0.24)	0.12 (0.10-0.15)	0.06 (0.04-0.08)
Sample population proportions	0.18	0.14	0.12	0.19	0.21	0.11	0.05
Recruitment proportions	0.18	0.15	0.12	0.19	0.21	0.11	0.05
Equilibrium sample distribution	0.19	0.14	0.12	0.19	0.21	0.11	0.05
Mean network size, N (adjusted)	7.19	11.33	9.34	6.57	7.69	6.82	6.41
Mean network size, N (unadjusted)	98.65	145.23	126.16	125.60	108.46	166.41	27.17
Homophily, (Hx)	0.12	0.11	0.07	0.00	0.00	0.09	0.23
Affiliation homophily, (Ha)	0.13	0.06	0.05	0.04	-0.01	0.10	0.24
Degree homophily, (Hd)	-0.06	0.05	0.02	-0.15	0.00	-0.11	-0.17
Population weights	1.11	0.68	0.82	1.16	1.01	1.09	1.08
Recruitment component, (RCx)	1.04	1.01	1.00	0.99	1.01	0.97	0.90
Degree component, (DCx)	1.07	0.68	0.82	1.17	1.00	1.13	1.20
Standard error of P	0.02	0.01	0.01	0.02	0.02	0.01	0.01

Table A8. RDS sample homophily by smoking status.

	Smoking status of recruit (alter)	
Smoking status of recruiter	Current smoker	Non-smoker
Current smoker:		
Recruitment count	388	178
Selection proportion, S	0.67	0.31
Demographically adjusted count	427.22	195.99
Data-smoothed count	427.22	195.99
Data-smoothed proportion	0.67	0.31
Non-smoker:		
Recruitment count	230	157
Selection proportion, S	0.59	0.41
Demographically adjusted count	195.99	133.78
Data-smoothed count	195.99	133.78
Data-smoothed proportion	0.59	0.41
Total:		
Recruitment count	618	335
Estimated population proportions (95% CI)	0.63 (0.59-0.67)	0.37 (0.33-0.41)
Sample population proportions	0.65	0.36
Recruitment proportions	0.65	0.36
Equilibrium sample distribution	0.65	0.35
Mean network size, N (adjusted)	7.97	7.18
Mean network size, N (unadjusted)	133.02	93.51
Homophily, (Hx)	0.15	0.06
Affiliation homophily, (Ha)	0.09	0.09
Degree homophily, (Hd)	0.06	-0.07
Population weights	0.98	1.04
Recruitment component, (RCx)	1.01	0.98
Degree component, (DCx)	0.96	1.07
Standard error of P	0.02	0.02

Appendix 1. Figures



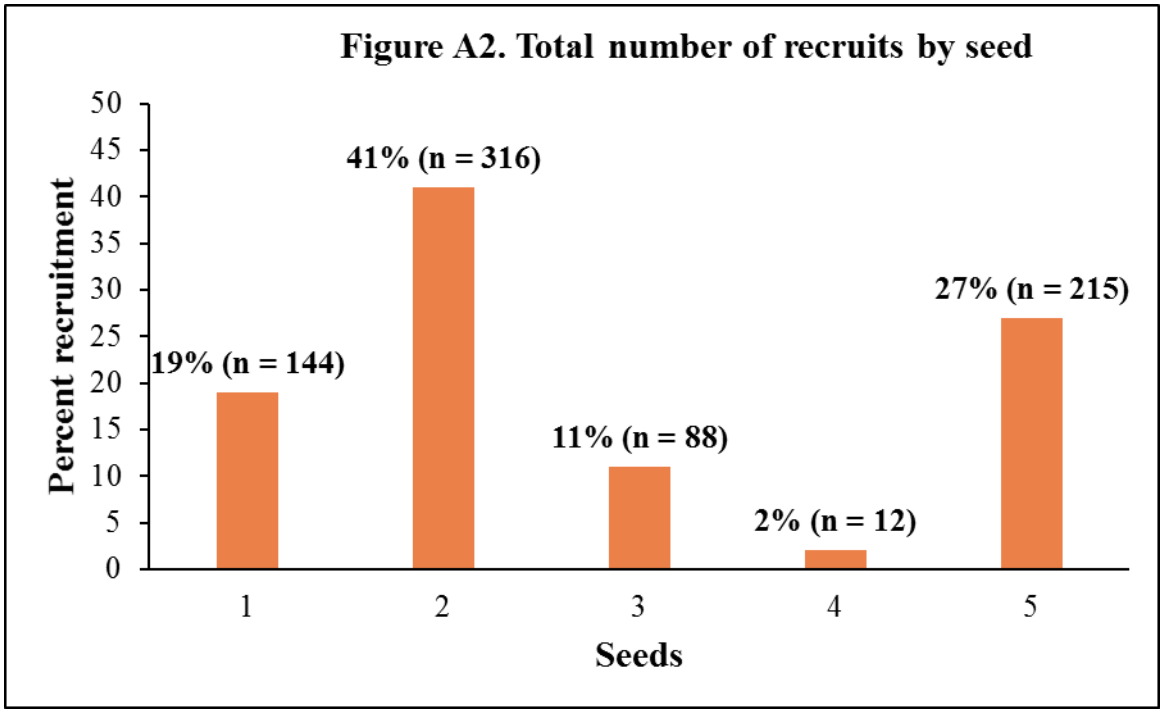


Figure A2. Total number of recruits by seed
Percent recruitment
50
45
40
35
30
25
20
15
10
5
0
41% (n = 316)
27% (n = 215)
19% (n = 144)
11% (n = 88)
2% (n = 12)
1
2
3
4
5
Seeds

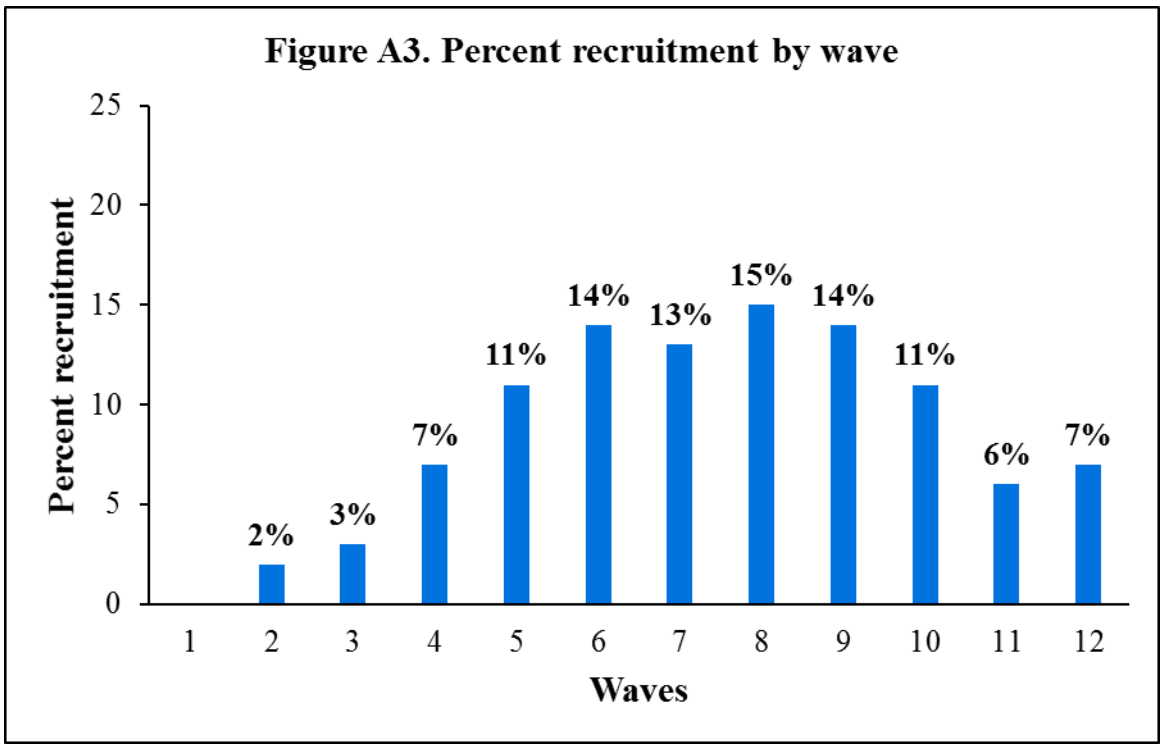


Figure A3. Percent recruitment by wave
Percent recruitment
25
20
15
10
5
0
2%
3%
7%
11%
14%
13%
15%
14%
11%
6%
7%
1
2
3
4
5
6
7
8
9
10
11
12
Waves

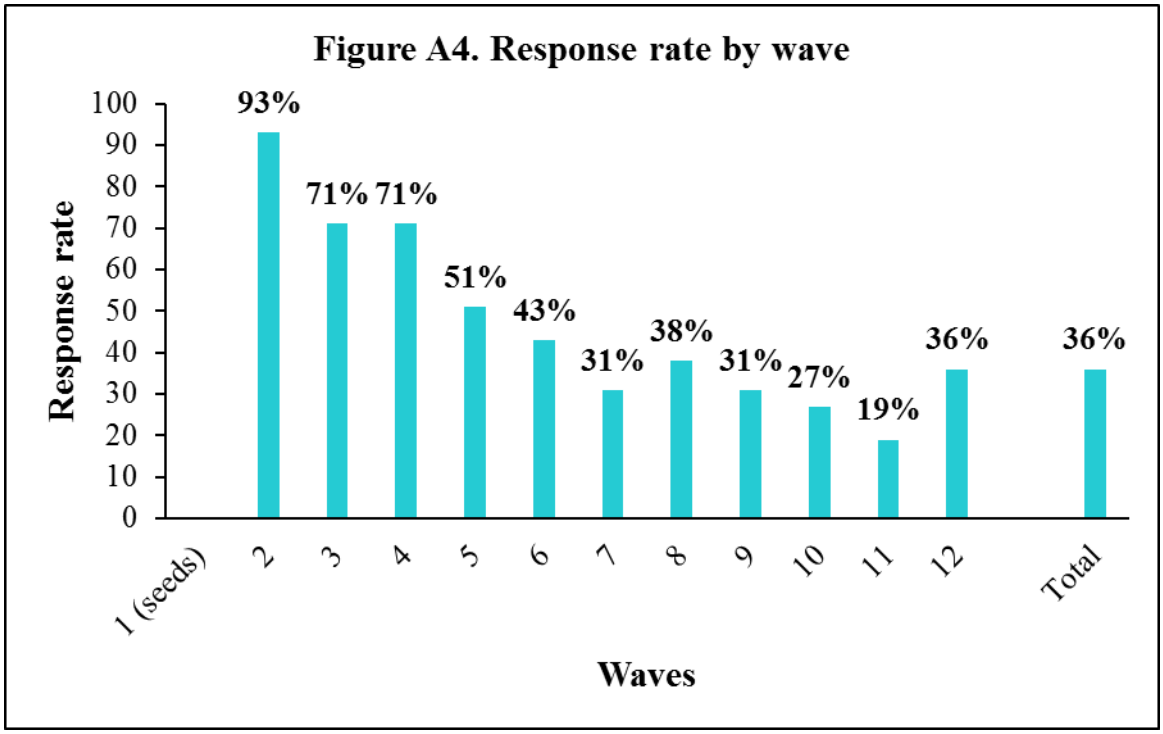


Figure A4. Response rate by wave
Response rate
100
90
80
70
60
50
40
30
20
10
0
93%
71%
71%
51%
43%
31%
38%
31%
27%
19%
36%
36%
1 (seeds)
2
3
4
5
6
7
8
9
10
11
12
Total
Waves

|___|___|___|___|___|___|
Participant ID

|___|___| |___|___| |___|___|	|___|___|	|___|___|	|___|___|___|
Date of Interview	Area	Interviewer ID	Survey Number

American Indian Adult Tobacco Survey

MINNESOTA 2009-2011

TABLE OF CONTENTS

OFFICE USE ONLY:

|___|___|	*|___|___| |___|___| |___|___|*
SURVEY EDITOR INITIALS	*DATE COMPLETED*

INTERVIEWER INSTRUCTIONS

- WATCH FOR SKIP PATTERNS
- **NOTES TO THE INTERVIEWER ARE IN ALL CAPS**. DO NOT READ OUT LOUD.
- WRITE **ALL IN CAPS** AND **BLOCK NUMBERS**:
  0 / 2 3 4 5 6 7 8 9
- WRITE **WHOLE NUMBERS** ONLY (round up if necessary):

EXAMPLE

101. How tall are you? .....|__**5**__| FEET |__**0**__|__**2**__| INCHES
[ENTER BLOCK NUMBERS IN FEET AND INCHES]
DON'T KNOW/NOT SURE.....☐
REFUSED .....☐

- USE A **PENCIL ONLY**
- NEATLY FILL IN THE APPROPRIATE BOXES
- COMPLETELY ERASE ANY MISTAKES

INCORRECT:

1. Not including ceremonial or sacred use, have you ever smoked a cigarette, even one or two puffs?
Yes .....☒
No .....☐ **IF NO SKIP TO Q37 NONSMOKER**
DON'T KNOW/NOT SURE .....☐
REFUSED.....☐

CORRECT:

2. Not including ceremonial or sacred use, have you ever smoked a cigarette, even one or two puffs?
Yes .....■
No .....☐ **IF NO SKIP TO Q37 NONSMOKER**
DON'T KNOW/NOT SURE .....☐
REFUSED.....☐

NOW READ THE FOLLOWING STATEMENT TO THE PARTICIPANT:

"Before we start, I will remind you of a few things, there are no right or wrong answers. I must read the questions and the responses exactly as they are written. I cannot help you with either the questions or the answers. If you need a question or response repeated, please ask, and I will do so. Are you ready to begin?"

RECORD START TIME AND BEGIN INTERVIEW.

|___|___| : |___|___| ☐ am ☐ pm **INTERVIEW START TIME**

SECTION 1: GENERAL HEALTH

1. Would you say that in general your health is:

   Excellent ..... ☐
   Very good ..... ☐
   Good ..... ☐
   Fair ..... ☐
   Poor ..... ☐
   DON'T KNOW/NOT SURE ..... ☐
   REFUSED ..... ☐

SECTION 2: COMMERCIAL CIGARETTE USE

2. Not including ceremonial or sacred use, in your entire life have you ever smoked a cigarette, even one or two puffs?

   Yes ..... ☐
   No ..... ☐ **IF NO SKIP TO Q37 NONSMOKER**
   DON'T KNOW/NOT SURE ..... ☐
   REFUSED ..... ☐

3. Not including ceremonial or sacred use, how old were you the first time you smoked a cigarette, even one or two puffs? **[DO NOT READ CATEGORIES]**

   0 TO 5 YRS ..... ☐
   6 TO 11 YRS ..... ☐
   12 TO 13 YRS ..... ☐
   14 TO 15 YRS ..... ☐
   16 TO 17 YRS ..... ☐
   18 TO 21 YRS ..... ☐
   22 TO 29 YRS ..... ☐
   30+ YRS ..... ☐
   DON'T KNOW/NOT SURE ..... ☐
   REFUSED ..... ☐

4. Not including ceremonial or sacred use, in your entire life have you smoked at least 100 cigarettes, about 5 packs?

   Yes ..... ☐
   No ..... ☐
   DON'T KNOW/NOT SURE ..... ☐
   REFUSED ..... ☐

SECTION 2. COMMERCIAL CIGARETTE USE CONTINUED…

5. How old were you when you started smoking **regularly**? **[DO NOT READ CATEGORIES]**

   NEVER SMOKED REGULARLY ..... ☐
   0 TO 5 YRS ..... ☐
   6 TO 11 YRS..... ☐
   12 TO 13 YRS..... ☐
   14 TO 15 YRS..... ☐
   16 TO 17 YRS..... ☐
   18 TO 21 YRS..... ☐
   22 TO 29 YRS..... ☐
   30+ YRS..... ☐
   DON'T KNOW/NOT SURE..... ☐
   REFUSED..... ☐

6. Do you **now** smoke cigarettes every day, some days or not at all?

   Every day ..... ☐
   Some days..... ☐
   Not at all ..... ☐ **SKIP TO Q34 FORMER SMOKER**
   DON'T KNOW/NOT SURE..... ☐
   REFUSED..... ☐

7. During the past 30 days, on about how many days did you smoke cigarettes? **[DO NOT READ CATEGORIES]**

   NONE OR ZERO ..... ☐ **SKIP TO Q34 FORMER SMOKER**
   1 TO 5 DAYS..... ☐
   6 TO 10 DAYS ..... ☐
   11 TO 14 DAYS ..... ☐
   15 TO 19 DAYS ..... ☐
   20 TO 28 DAYS ..... ☐
   29 TO 30 DAYS ..... ☐**[EVERYDAY]**
   DON'T KNOW/NOT SURE..... ☐
   REFUSED..... ☐

8. On the days that you smoked during the last 30 days, about how many cigarettes did you smoke a day? **[DO NOT READ CATEGORIES]**

   1 TO 2 CIGARETTES ..... ☐
   3 TO 5 CIGARETTES..... ☐
   6 TO 10 CIGARETTES (LESS THAN ½ PACK)..... ☐
   11 TO 20 CIGARETTES (AT LEAST ½ PACK TO 1 PACK)..... ☐
   21 TO 40 CIGARETTES (MORE THAN 1 PACK TO 2 PACKS)..... ☐
   41 TO 60 CIGARETTES (MORE THAN 2 PACKS TO 3 PACKS)..... ☐
   61+ CIGARETTES (MORE THAN 3 PACKS) ..... ☐
   DON'T KNOW/NOT SURE..... ☐
   REFUSED..... ☐

SECTION 2. COMMERCIAL CIGARETTE USE – CURRENT SMOKERS

9. **[CURRENT]** In the past 30 days, were you more likely to smoke when you…
   - Were with other people..... ☐
   - Were alone ..... ☐
   - Doesn't matter ..... ☐
   - DON'T KNOW/NOT SURE..... ☐
   - REFUSED ..... ☐

10. **[CURRENT]** How soon after you wake up do you have your first cigarette?
   - Within 5 minutes ..... ☐
   - 6 to 30 minutes..... ☐
   - 31 to 60 minutes ..... ☐
   - After 60 minutes..... ☐
   - DON'T KNOW/NOT SURE..... ☐
   - REFUSED ..... ☐

11. **[CURRENT]** What kind of cigarettes do you usually smoke? **[CHOOSE ONE]**
   - Light/Ultra light ..... ☐
   - Menthol..... ☐
   - Natural (no additives)..... ☐
   - Regular filtered..... ☐
   - Regular unfiltered ..... ☐
   - DON'T KNOW/NOT SURE..... ☐
   - REFUSED ..... ☐

12. **[CURRENT]** Not including ceremonial or sacred use, do you ever smoke cigarettes that have an American Indian image or name?
   - Never..... ☐
   - Sometimes ..... ☐
   - Usually ..... ☐
   - DON'T KNOW/NOT SURE..... ☐
   - REFUSED ..... ☐

13. **[CURRENT]** In the **past 30 days**, has anyone offered you a cigarette, not for ceremonial or spiritual reasons?
   - Yes ..... ☐
   - No ..... ☐
   - DON'T KNOW/NOT SURE..... ☐
   - REFUSED ..... ☐

14. **[CURRENT]** In the **past 30 days** have you offered anyone a cigarette, not for ceremonial or spiritual reasons?
   - Yes ..... ☐
   - No ..... ☐
   - DON'T KNOW/NOT SURE..... ☐
   - REFUSED ..... ☐

SECTION 3A. QUITTING SMOKING – CURRENT SMOKERS

15. **[CURRENT]** During the past 12 months, how many times have you stopped smoking for one day or longer because you were trying to quit? **[DO NOT READ CATEGORIES]**

I have never tried to quit..... ☐ **SKIP TO Q18**
I have tried to quit but not in the past 12 mo... ☐ **SKIP TO Q18**
1 TO 2 TIMES.....☐
3 TO 4 TIMES.....☐
5 TO 9 TIMES.....☐
10+ TIMES.....☐
DON'T KNOW/NOT SURE..... ☐
REFUSED..... ☐

16. **[CURRENT]** The last time you tried to quit smoking, did you use…

	Yes	No	DK	REF
a. Nicotine patch.....	☐	☐	☐	☐
b. Nicotine gum.....	☐	☐	☐	☐
c. Nicotine nasal spray.....	☐	☐	☐	☐
d. Nicotine inhaler.....	☐	☐	☐	☐
e. Nicotine lozenges.....	☐	☐	☐	☐
f. Zyban/Wellbutrin (BUPROPRION)	☐	☐	☐	☐
g. Chantix (VARENICLINE).....	☐	☐	☐	☐

17. **[CURRENT]** The last time you tried to quit smoking, did you…

	Yes	No	DK	REF
a. Use any native traditional healing methods? For example, go to a sweat lodge, use herbal medicines, or pray?.....	☐	☐	☐	☐
b. Use a stop smoking class or counseling?....	☐	☐	☐	☐
c. Use a quit smoking phone help line?	☐	☐	☐	☐

18. **[CURRENT]** How much support do you think you have among your friends and family for quitting smoking?

None..... ☐
A little..... ☐
Some..... ☐
Quite a bit or a lot ..... ☐
DON'T KNOW/NOT SURE..... ☐
REFUSED..... ☐

SECTION 3A. QUITTING SMOKING – CURRENT SMOKERS CONTINUED…

19. **[CURRENT]** Do you want to quit smoking cigarettes?

Yes ..... ☐
No ..... ☐ **IF NO SKIP TO Q22**
DON'T KNOW/NOT SURE..... ☐
REFUSED ..... ☐

20. **[CURRENT]** Are you seriously thinking about quitting smoking cigarettes within the **next 6 months**?

Yes ..... ☐
No ..... ☐ **IF NO SKIP TO Q22**
DON'T KNOW/NOT SURE..... ☐
REFUSED ..... ☐

21. **[CURRENT]** Are you planning to quit smoking cigarettes within the **next 30 days**?

Yes ..... ☐
No ..... ☐
DON'T KNOW/NOT SURE..... ☐
REFUSED ..... ☐

22. **[CURRENT]** If you decided to give up smoking altogether, how likely do you think you would be able to succeed? Would you say…

Very likely ..... ☐
Somewhat likely ..... ☐
Somewhat unlikely..... ☐
Very unlikely ..... ☐
DON'T KNOW/NOT SURE..... ☐
REFUSED ..... ☐

SECTION 3A. QUITTING SMOKING – CURRENT SMOKERS CONTINUED…

23. **[CURRENT]** If you were trying to quit smoking and cost was not an issue, would you use any of the following programs, products or medicine to help you quit?

	Yes	No	DK	Ref
a. Nicotine patch, gum, or lozenges?	☐	☐	☐	☐
b. Medications like Zyban or Chantix?	☐	☐	☐	☐
c. Quit smoking phone support?	☐	☐	☐	☐
d. Quit smoking internet support?	☐	☐	☐	☐
e. Individual in-person support?	☐	☐	☐	☐
f. Group support?	☐	☐	☐	☐
g. Alternative methods like acupuncture or hypnosis?	☐	☐	☐	☐
h. Take home materials, like brochures, booklets & videos?	☐	☐	☐	☐
i. Tribal traditional teachings and/or ceremonies?	☐	☐	☐	☐
j. All or mostly American Indian staff?	☐	☐	☐	☐
k. All or mostly American Indian participants?	☐	☐	☐	☐

24. **[CURRENT]** In the **past 12 months**, have you seen a health care provider, like a doctor or nurse, to get a check–up or any kind of care for yourself?

Yes ..... ☐
No ..... ☐ **IF NO SKIP TO Q26**
DON'T KNOW/NOT SURE..... ☐
REFUSED ..... ☐

SECTION 3A. QUITTING SMOKING – CURRENT SMOKERS CONTINUED…

25. **[CURRENT]** During the **past 12 months** did this health care provider…

	Yes	No	DK	REF_
a. Ask if you smoke?	☐	☐	☐	☐
		IF NO SKIP TO Q26		
b. Advise you not to smoke?	☐	☐	☐	☐
		IF NO SKIP TO Q26		
c. Recommend any product or prescription for a medication to help you quit?	☐	☐	☐	☐
d. Suggest that you set a specific date to quit smoking?	☐	☐	☐	☐
e. Provide you with booklets, videos, or other materials to help you quit?	☐	☐	☐	☐
f. Suggest that you use traditional healing methods to help you quit?	☐	☐	☐	☐
g. Offer you a return visit or phone call to help you quit?	☐	☐	☐	☐
h. Did the health care provider suggest that you use a quit smoking program, such as a phone helpline, a class or an online website or program?.....	☐	☐	☐	☐
		IF NO SKIP TO Q26		
h1. Did this person help you access the quit smoking program?	☐	☐	☐	☐

26. **[CURRENT]** In the **past 12 months**, have you seen a traditional or native healer or medicine person to get any kind of care for yourself?

Yes ..... ☐
No ..... ☐ **IF NO SKIP TO Q28**
DON'T KNOW/NOT SURE..... ☐
REFUSED ..... ☐

27. **[CURRENT]** During the **past 12 months** did this traditional or native healer…

	Yes	No	DK	REF_
a. Ask if you smoke?	☐	☐	☐	☐
		IF NO, SKIP TO Q28		
b. Advise you not to smoke?	☐	☐	☐	☐
		IF NO, SKIP TO Q28		
c. Suggest that you use traditional methods (herbal medicines, prayer, or ceremony) to stop smoking?	☐	☐	☐	☐

SECTION 3A. QUITTING SMOKING – CURRENT SMOKERS CONTINUED…

28. **[CURRENT]** Recently new cigarette taxes have been added. What effects, if any, did the recent price increase have on your smoking?

	Yes	No	DK	REF_
a. Help you think about quitting?	☐	☐	☐	☐
b. Help you cut down on cigarettes?	☐	☐	☐	☐
c. Help you make a quit attempt?	☐	☐	☐	☐

29. **[CURRENT]** What effects, if any, do smoking restrictions at work, home, restaurants, bars or elsewhere have on your smoking? Would you say smoking restrictions…

	Yes	No	DK	REF_
a. Help you think about quitting?	☐	☐	☐	☐
b. Help you cut down on cigarettes?	☐	☐	☐	☐
c. Help you make a quit attempt?	☐	☐	☐	☐

30. **[CURRENT]** Next I'm going to read a list of statements about stop-smoking aids (like nicotine gum, patches or medications). Please tell me if you agree or disagree with each statement.

	Agree	Disagree	DK	REF
a. If you decided you wanted to quit, you would be able to quit without stop smoking aids.....	☐	☐	☐	☐
b. Stop smoking aids are too expensive.....	☐	☐	☐	☐
c. You know how to use stop smoking aids properly	☐	☐	☐	☐
d. Stop smoking aids are too hard to get……....	☐	☐	☐	☐
e. Stop smoking aids might harm your health.....	☐	☐	☐	☐

SECTION 3A. QUITTING SMOKING – CURRENT SMOKERS CONTINUED…

31. **[CURRENT]** About how many times in the **past 12 months** has anyone asked you to put out a cigarette or not light up when you were about to do so? **[DO NOT READ CATEGORIES]**

NONE OR ZERO ..... ☐ **IF NO SKIP TO Q32**
1 TO 2 TIMES..... ☐
3 TO 4 TIMES..... ☐
5 TO 9 TIMES..... ☐
10+ TIMES ..... ☐
DON'T KNOW/NOT SURE..... ☐
REFUSED ..... ☐

a. On the most recent occasion you were asked not to smoke, who was that person? Was it a…

Relative..... ☐
Friend or acquaintance ..... ☐
Stranger..... ☐
DON'T KNOW/NOT SURE..... ☐
REFUSED ..... ☐

b. Was that person younger than you, about your age or older than you?

Younger than you ..... ☐
About your age..... ☐
Older than you ..... ☐
DON'T KNOW/NOT SURE..... ☐
REFUSED ..... ☐

32. **[CURRENT]** In the **past 30 days**, have you had at least one drink of any alcoholic beverage such as beer, wine, or liquor?

Yes ..... ☐
No ..... ☐ **IF NO SKIP TO Q49**
DON'T KNOW/NOT SURE..... ☐
REFUSED ..... ☐

33. **[CURRENT]** In the **past 30 days**, would you say you were…

More likely to smoke while you were drinking..... ☐ **SKIP TO Q49**
More likely to smoke while you were not drinking..... ☐ **SKIP TO Q49**
Doesn't matter if you were drinking..... ☐ **SKIP TO Q49**
DON'T KNOW/NOT SURE..... ☐ **SKIP TO Q49**
REFUSED..... ☐ **SKIP TO Q49**

SECTION 3B. QUITTING SMOKING – FORMER SMOKERS

34. **[FORMER]:** About how long has it been since you **last** smoked a cigarette? Would you say it was…

Never smoked regularly	☐
	SKIP TO Q37
Within the past month (≤1 month ago)	☐
Within the past 3 months (>1 month but ≤3 months ago)	☐
Within the past 6 months (>6 months but ≤1 year ago)	☐
Within the past year (>1 year but ≤5 years ago)	☐
Within the past 5 years (>5 years but ≤10 years ago)	☐
Within the past 10 years	☐
Over 10 years ago	☐
DON'T KNOW/NOT SURE	☐
REFUSED	☐

35. **[FORMER]:** The last time you quit smoking, Did you use…

	Yes	No	DK	REF
a. Nicotine patch	☐	☐	☐	☐
b. Nicotine gum	☐	☐	☐	☐
c. Nicotine nasal spray	☐	☐	☐	☐
d. Nicotine inhaler	☐	☐	☐	☐
e. Nicotine lozenges	☐	☐	☐	☐
f. Zyban/Wellbutrin (BUPROPRION)	☐	☐	☐	☐
g. Chantix (VARENICLINE)	☐	☐	☐	☐

36. **[FORMER]:** The last time you quit smoking, did you…

	Yes	No	DK	REF
a. Use any native or traditional healing methods? For example, go to a sweat lodge, use herbal medicines, or pray?	☐	☐	☐	☐
b. Use a stop smoking class or counseling?	☐	☐	☐	☐
c. Use a quit smoking phone line?	☐	☐	☐	☐

SECTION 3C. QUITTING SMOKING – FORMER & NON-SMOKERS

37. **[FORMER & NON]:** How much support do you think you have among your friends and family for staying smoke-free?

None	☐
A little or some	☐
Quite a bit	☐
A lot	☐
DON'T KNOW/NOT SURE	☐
REFUSED	☐

SECTION 3C. QUITTING SMOKING – FORMER & NON-SMOKERS CONTINUED…

38. **[FORMER & NON]:** In the **past 12 months**, have you seen a health care provider, like a doctor or nurse, to get a check–up or any kind of care for yourself?

Yes ..... ☐
No ..... ☐ **IF NO SKIP TO Q41**
DON'T KNOW/NOT SURE..... ☐
REFUSED ..... ☐

39. **[FORMER & NON]:** During the **past 12 months** did this health care provider ask if you smoke?

Yes ..... ☐
No ..... ☐ **IF NO SKIP TO Q41**
DON'T KNOW/NOT SURE..... ☐
REFUSED ..... ☐

40. **[ONLY ASK THOSE THAT QUIT LESS THAN 1 YR AGO; CHECK Q34]:** During the **past 12 months** did this health care provider …

	Yes	No	DK	REF
a. Advise you not to smoke?	☐	☐	☐	☐
	IF NO SKIP TO Q41			
b. Recommend any product or prescription for a medication to help you quit?	☐	☐	☐	☐
c. Suggest that you set a specific date to quit?	☐	☐	☐	☐
d. Provide you with booklets, videos, or other materials to help you quit?	☐	☐	☐	☐
e. Suggest that you use traditional healing methods to help you quit?	☐	☐	☐	☐
f. Offer you a return visit or phone call to help you quit?	☐	☐	☐	☐
g. Suggest that you seek help to quit smoking using a program, such as a clinic program, phone helpline, a class or the internet?	☐	☐	☐	☐
	IF NO, SKIP TO Q41			
h. Did this person help you access the quit smoking program?	☐	☐	☐	☐

SECTION 3C. QUITTING SMOKING – FORMER & NON-SMOKERS CONTINUED…

41. **[FORMER & NON]:** In the **past 12 months**, have you seen a traditional or native healer or medicine man to get any kind of care for yourself?

Yes ..... ☐
No ..... ☐ **IF NO SKIP TO Q45**
DON'T KNOW/NOT SURE..... ☐
REFUSED ..... ☐

42. **[FORMER & NON]:** During the most recent visit, did this person **ask if you smoke?**

Yes ..... ☐
No ..... ☐ **IF NO SKIP TO Q45**
DON'T KNOW/NOT SURE..... ☐
REFUSED ..... ☐

43. **[ONLY ASK THOSE THAT QUIT LESS THAN 1 YR AGO; CHECK Q34]:** During the most recent visit, did this person **advise you not to smoke**?

Yes ..... ☐
No ..... ☐ **IF NO SKIP TO Q45**
DON'T KNOW/NOT SURE..... ☐
REFUSED ..... ☐

44. **[ONLY ASK THOSE THAT QUIT LESS THAN 1 YR AGO; CHECK Q34]:** Did this person suggest traditional healing methods (like herbal medicines, prayer, or ceremony) to stop smoking?

Yes ..... ☐
No ..... ☐
DON'T KNOW/NOT SURE..... ☐
REFUSED..... ☐

45. **[FORMER & NON]** Recently new cigarette taxes have been added. Did this price increase help you stay smoke-free?

Yes ..... ☐
No ..... ☐
DON'T KNOW/NOT SURE..... ☐
REFUSED ..... ☐

46. **[FORMER & NON]** Would you say that smoking restrictions at work, home, restaurants, bars or elsewhere help you stay smoke-free?

Yes ..... ☐
No ..... ☐
DON'T KNOW/NOT SURE..... ☐
REFUSED ..... ☐

SECTION 3C. QUITTING SMOKING – FORMER & NON-SMOKERS CONTINUED…

47. **[FORMER & NON]** In the **past 30 days**, has anyone offered you a cigarette, not for ceremonial or spiritual reasons?

Yes ..... ☐
No ..... ☐
DON'T KNOW/NOT SURE..... ☐
REFUSED ..... ☐

48. **[FORMER & NON]** In the **past 30 days**, have you had at least one drink of any alcoholic beverage such as beer, wine, or liquor?

Yes ..... ☐
No ..... ☐
DON'T KNOW/NOT SURE..... ☐
REFUSED ..... ☐

SECTION 4: OTHER COMMERICAL TOBACCO USE

49. Not including ceremonial or sacred use, think of all the cigars you ever smoked. In your entire life, have you smoked **at least 20 cigars**?

Yes ..... ☐
No ..... ☐ **IF NO SKIP TO Q51**
DON'T KNOW/NOT SURE..... ☐
REFUSED ..... ☐

50. During **the past 30 days**, on how many days did you **smoke cigars**? **[DO NOT READ CATEGORIES]**

NONE OR ZERO ..... ☐
1 TO 5 DAYS..... ☐
6 TO 9 DAYS..... ☐
10 TO 14 DAYS ..... ☐
15 TO 19 DAYS ..... ☐
20 TO 29 DAYS ..... ☐
30 DAYS..... ☐
DON'T KNOW/NOT SURE ..... ☐
REFUSED ..... ☐

51. Not including ceremonial or sacred use, in your entire life have you **smoked tobacco in a pipe at least 20 times**?

Yes ..... ☐
No ..... ☐ **IF NO SKIP TO Q53**
DON'T KNOW/NOT SURE..... ☐
REFUSED ..... ☐

SECTION 4: OTHER COMMERCIAL TOBACCO USE CONTINUED…

52. Not including ceremonial or sacred use, **during the past 30 days**, on how many days did you **smoke tobacco in a pipe**? **[DO NOT READ CATEGORIES]**

NONE OR ZERO ..... ☐
1 TO 5 DAYS..... ☐
6 TO 9 DAYS..... ☐
10 TO 14 DAYS ..... ☐
15 TO 19 DAYS ..... ☐
20 TO 29 DAYS ..... ☐
30 DAYS ..... ☐
DON'T KNOW/NOT SURE..... ☐
REFUSED..... ☐

53. Not including ceremonial or sacred use, in your entire life have you used **smokeless tobacco,** such as snuff, dip, chew or snus, **at least 20 times**?

Yes ..... ☐
No ..... ☐ **IF NO SKIP TO Q56**
DON'T KNOW/NOT SURE..... ☐
REFUSED..... ☐

54. During the **past 30 days**, on how many days did you use **<u>smokeless</u>** tobacco? **[DO NOT READ CATEGORIES]**

NONE OR ZERO ..... ☐ **IF NONE SKIP TO Q56**
1 TO 5 DAYS ..... ☐
6 TO 9 DAYS ..... ☐
10 TO 14 DAYS..... ☐
15 TO 19 DAYS..... ☐
20 TO 29 DAYS..... ☐
30 DAYS..... ☐
DON'T KNOW/NOT SURE..... ☐
REFUSED ..... ☐

55. **[CURRENT SMOKER]** In the **past 30 days**, did you use any smokeless tobacco product when you couldn't smoke cigarettes?

Yes ..... ☐
No ..... ☐
DON'T KNOW/NOT SURE..... ☐
REFUSED ..... ☐

SECTION 5: CEREMONIAL OR SACRED USE

I have some questions about your ceremonial or sacred tobacco use. Some, but not all, American Indian people use tobacco in this way. This is different than smoking for pleasure or out of habit. Also, so we are using the same definition, by tobacco, I mean all types of tobacco that are used for ceremonial and sacred use, even if you know them by a different name.

56. Have you ever used tobacco for ceremonial prayer or in a sacred way?

Yes	☐	
No	☐	**IF NO SKIP TO Q61**
DON'T KNOW/NOT SURE	☐	**IF DK SKIP TO Q61**
REFUSED	☐	**IF REF SKIP TO Q61**

57. When was the last time you used tobacco in this way?

Within the past day	☐	
Within the past week	☐	
Within the past month	☐	
Within the past year	☐	
More than a year ago	☐	**IF >1 YR SKIP TO Q61**
DON'T KNOW/NOT SURE	☐	
REFUSED	☐	

58. In the past year, have you used a natural tobacco plant or mixture of plants and barks for ceremonial prayer or sacred use (this is the tobacco that is usually not purchased in a store)?

Yes	☐
No	☐
DON'T KNOW/NOT SURE	☐
REFUSED	☐

59. In the past year, have you used a commercial tobacco product that was purchased in a store, like pouch tobacco or cigarettes, for ceremonial prayer or sacred use?

Yes	☐
No	☐
DON'T KNOW/NOT SURE	☐
REFUSED	☐

60. What type of tobacco do you **usually** use for this use? **[CHOOSE ONE]**

Natural tobacco plant or mixture of plants/bark (usually not from a store)	☐
Cigarettes (from a store)	☐
Pouch or loose/commercial tobacco (from a store)	☐
DON'T KNOW/NOT SURE	☐
REFUSED	☐

SECTION 5: CEREMONIAL OR SACRED USE CONTINUED…

61. What type of tobacco do you **usually** see other Native people use for ceremonial prayer or sacred use? **[CHOOSE ONE]**

I never see anyone else use tobacco this way…….. ☐
Natural tobacco plant or mixture of plants/bark (usually not from a store)…….. ☐
Cigarettes (from a store)…….. ☐
Pouch or loose/commercial tobacco (from a store)..... ☐
DON'T KNOW/NOT SURE..... ☐
REFUSED..... ☐

SECTION 6: SECONDHAND SMOKE (SHS)

This section is about secondhand smoke exposure. Secondhand smoke is the smoke that comes from burning a cigarette or other tobacco products.

62. During the **past 30 days**, have you seen or heard any ads or commercials encouraging smokers to quit or about the dangers of secondhand smoke?

Yes ..... ☐
No ..... ☐
DON'T KNOW/NOT SURE..... ☐
REFUSED ..... ☐

63. In the **past 12 months**, have you asked someone to put out a cigarette or not light up when they were about to do so?

Yes ..... ☐
No ..... ☐ **IF NO SKIP TO Q64**
DON'T KNOW/NOT SURE..... ☐
REFUSED ..... ☐

a. On the most recent occasion you asked someone not to smoke, who was that person? Was it a…
Relative..... ☐
Friend or acquaintance ..... ☐
Stranger..... ☐
DON'T KNOW/NOT SURE..... ☐
REFUSED ..... ☐

b. Was that person younger than you, about your age or older than you?
Younger than you ..... ☐
About your age..... ☐
Older than you ..... ☐
DON'T KNOW/NOT SURE..... ☐
REFUSED ..... ☐

SECTION 6: SECONDHAND SMOKE (SHS) CONTINUED…

c. What was the **primary** reason you asked that person not to smoke? Was it because… **[CHOOSE ONE]**

Smoke is annoying to you..... ☐
You were concerned about your health ..... ☐
You were concerned about the health of a child ..... ☐
You were concerned about the health of the smoker..... ☐
You were trying to quit, or..... ☐
You were enforcing a policy ..... ☐
Some other reason, ... ☐
What was that? _____
DON'T KNOW/NOT SURE..... ☐
REFUSED ..... ☐

64. Not including ceremonial or sacred use, during the **past 7 days**, that is, since **[FILL IN THE DAY OF THE WEEK]**, on how many days did anyone smoke cigarettes, cigars, or pipes anywhere inside your home? Do not include decks, porches or garages. **# OF DAYS**

☐ 0 ☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐ 6 ☐ 7
DON'T KNOW/NOT SURE..... ☐
REFUSED..... ☐

65. What rules do you have about smoking **inside** your home? Would you say smoking is allowed…

Allowed everywhere & at anytime inside your home..... ☐
Allowed in some places or at some times home..... ☐
Not allowed anywhere or at anytime inside your home ☐
DON'T KNOW/NOT SURE..... ☐
REFUSED..... ☐

66. During the **past 7 days,** that is since, **[FILL IN THE DAY OF THE WEEK]**, have you been in a car with someone else that was smoking?

Yes ..... ☐
No ..... ☐
HAVE NOT BEEN IN A CAR WITH SOMEONE ELSE IN PAST 7 DAYS ..... ☐
DON'T KNOW/NOT SURE..... ☐
REFUSED..... ☐

IF EMPLOYED (EITHER FT OR PT) GO TO Q68

IF NOT EMPLOYED, SKIP TO Q82

SECTION 6.1: WORKPLACE SHS

Now I have some questions about smoking at your workplace.

67. Please describe your current employment situation. Are you currently… **[CHECK ALL THAT APPLY]**

	Yes	No	DK	Ref
Employed full-time.....	☐	☐	☐	☐
Employed part-time.....	☐	☐	☐	☐
Retired.....	☐	☐	☐	☐
Unemployed.....	☐	☐	☐	☐
A home-maker.....	☐	☐	☐	☐
A student.....	☐	☐	☐	☐
Unable to work.....	☐	☐	☐	☐

68. How many paid jobs do you currently have?

Zero or none	☐	**IF NONE, SKIP TO Q82**
One paid job.....	☐	
Two paid jobs.....	☐	
Three or more paid jobs.....	☐	
DON'T KNOW/NOT SURE.....	☐	
REFUSED.....	☐	

69. Including **all of your paid jobs**, what is the total number of hours you usually work per week? **[DO NOT READ CATEGORIES]**

1 TO 9 HRS/WK.....	☐
10 TO 19 HRS/WK.....	☐
20 TO 29 HRS/WK.....	☐
30 TO 39 HRS/WK.....	☐
40 TO 49 HRS/WK.....	☐
50+ hrs/wk.....	☐
DON'T KNOW/NOT SURE.....	☐
REFUSED.....	☐

70. Now considering your current **primary job**, or the job where you work the most hours, how many hours per week do you usually work at this job? **[DO NOT READ CATEGORIES]**

1 TO 9 HRS/WK.....	☐
10 TO 19 HRS/WK.....	☐
20 TO 29 HRS/WK.....	☐
30 TO 39 HRS/WK.....	☐
40 TO 49 HRS/WK.....	☐
50+ hrs/wk.....	☐
DON'T KNOW/NOT SURE.....	☐
REFUSED.....	☐

SECTION 6.1: WORKPLACE SHS CONTINUED…

71.How long have you been at your current primary job? **# OF YEARS**

☐	☐	☐	☐	☐
1-2	3-4	5-9	10-19	20+

OR IF LESS THAN 1 YEAR, NUMBER OF MONTHS

☐	☐	☐	☐	☐
1-2	3-4	5-6	7-8	9-11

DON'T KNOW/NOT SURE..... ☐
REFUSED..... ☐

72.Is your primary job located on a reservation or off-reservation?

On a reservation..... ☐
Off a reservation..... ☐
Both on & off a reservation ..... ☐
DON'T KNOW/NOT SURE..... ☐
REFUSED..... ☐

73. What best describes your current primary job's worksite? Is it a…
[CHOOSE ONE]

Airport ..... ☐
Bank..... ☐
Bar ..... ☐
Casino..... ☐
Clinic ..... ☐
Entertainment (arcade, movie) ... ☐
Home (yours) ..... ☐
Home (someone else's) ..... ☐
Hospital or Emergency Room..... ☐
Hotel, motel, or lodge..... ☐
Library or museum..... ☐
Office..... ☐
Outside, such as a construction, fishing,
or lawn care ..... ☐ **IF OUTSIDE, SKIP TO Q75**
Plant, factory or warehouse..... ☐
Restaurant (serves alcohol)..... ☐
Restaurant (no alcohol) ..... ☐
School..... ☐
Store (gas or convenience) ..... ☐
Store (other retail, mall)..... ☐
Vehicle..... ☐
Some other setting, ... ☐ What is it?_____
DON'T KNOW/NOT SURE..... ☐
REFUSED..... ☐

SECTION 6.1: WORKPLACE SHS CONTINUED…

74. As far as you know, in the **past 7 days**, that is, since **[FILL IN THE DAY]**, has anyone **smoked in the area** where you work?

Yes ..... ☐
No ..... ☐
DON'T KNOW/NOT SURE ..... ☐
REFUSED ..... ☐

75. Which of the following best describes smoking rules **in the area** where you work? Smoking in my work area is…

Allowed in all areas ..... ☐
Allowed in some areas ..... ☐
Not allowed at all ..... ☐
DON'T KNOW/NOT SURE ..... ☐
REFUSED ..... ☐

76. Does your workplace have an official policy, such as signs, personal contracts, or written statements about smoking?

Yes ..... ☐
No ..... ☐ **IF NO SKIP TO Q78**
DON'T KNOW/NOT SURE ..... ☐
REFUSED ..... ☐

77. Is the policy enforced?

Always ..... ☐
Sometimes ..... ☐
Rarely ..... ☐
Never ..... ☐
DON'T KNOW/NOT SURE ..... ☐
REFUSED ..... ☐

78. Think about everyone who works at your workplace. About how many people at your workplace smoke or use other commercial tobacco products, not for ceremonial or sacred use? Would you say…

I don't work with other people. ... ☐ **SKIP TO Q80**
None ..... ☐
A few ..... ☐
Some ..... ☐
Most ..... ☐
All ..... ☐
DON'T KNOW/NOT SURE ..... ☐
REFUSED ..... ☐

SECTION 6.1: WORKPLACE SHS CONTINUED…

79. How much support do you think you have among the people you work with for quitting smoking or staying smoke-free?

I don't work with other people. ... ☐
None ..... ☐
A little ..... ☐
Some ..... ☐
Quite a bit or a lot ..... ☐
DON'T KNOW/NOT SURE ..... ☐
REFUSED ..... ☐

80. **[CURRENT SMOKERS ONLY]** Would you say you smoke more… [CHOOSE ONE]

At work (including both in and outside)……☐
At home (including both in and outside) ……..☐
Places other than work or home……..☐
About the same at work, home, and other places….☐
DON'T KNOW/NOT SURE……☐
REFUSED ..... ……☐

81. During the **past 30 days**, how often did you feel a high level of stress due to problems at work?

None of the time..... ☐
A little of the time..... ☐
Some of the time..... ☐
Most of the time ..... ☐
All of the time ..... ☐
DON'T KNOW/NOT SURE..... ☐
REFUSED ..... ☐

SECTION 6.1: WORKPLACE SHS CONTINUED…

82. During the **past 30 days**, how often did you feel a high level of stress due to problems outside of work?

None of the time..... ☐
A little of the time..... ☐
Some of the time..... ☐
Most of the time ..... ☐
All of the time ..... ☐
DON'T KNOW/NOT SURE..... ☐
REFUSED..... ☐

83. In the **past 7 days** has anyone smoked near you at any place besides your home, workplace or car?

Yes ..... ☐
No ..... ☐ **IF NO SKIP TO Q85**
DON'T KNOW/NOT SURE..... ☐
REFUSED..... ☐

84.The last time this happened, where were you? Were you at a…**[CHOOSE ONE]**

Bar or restaurant..... ☐
Building Entrance..... ☐ What building?_____
Casino/Bingo..... ☐
Community event (indoors)..... ☐
Community event (outdoors)..... ☐
Home or vehicle (someone else's) ☐
Outdoor (park) ..... ☐
Store ..... ☐
Some other setting, ... ☐ What is it?_____
DON'T KNOW/NOT SURE..... ☐
REFUSED..... ☐

SECTION 7: ATTITUDES ABOUT SHS POLICIES

I now have some questions about your opinions on smoking policies in different areas.

85. In the **indoor work areas** do you think smoking should be…
    - Allowed in all areas..... ☐
    - Allowed in some areas..... ☐
    - Not allowed at all..... ☐
    - DON'T KNOW/NOT SURE..... ☐
    - REFUSED..... ☐

86. In the **indoor areas of restaurants** do you think smoking should be…
    - Allowed in all areas..... ☐
    - Allowed in some areas..... ☐
    - Not allowed at all..... ☐
    - DON'T KNOW/NOT SURE..... ☐
    - REFUSED..... ☐

87. In the **indoor areas of community centers** do you think smoking should be…
    - Allowed in all areas..... ☐
    - Allowed in some areas..... ☐
    - Not allowed at all..... ☐
    - DON'T KNOW/NOT SURE..... ☐
    - REFUSED..... ☐

88. In the **indoor areas of casinos or bingo halls** do you think smoking should be…
    - Allowed in all areas..... ☐
    - Allowed in some areas..... ☐
    - Not allowed at all..... ☐
    - DON'T KNOW/NOT SURE..... ☐
    - REFUSED..... ☐

89. In the **indoor areas of other tribal buildings** do you think smoking should be…
    - Allowed in all areas..... ☐
    - Allowed in some areas..... ☐
    - Not allowed at all..... ☐
    - DON'T KNOW/NOT SURE..... ☐
    - REFUSED..... ☐

90. At **outdoor community events, like pow wows**, do you think smoking should be…
    - Allowed in all areas..... ☐
    - Allowed in some areas..... ☐
    - Not allowed at all..... ☐
    - DON'T KNOW/NOT SURE..... ☐
    - REFUSED..... ☐

SECTION 8: SOCIAL INFLUENCES

The next few questions are about your thoughts on cigarette smoking and the use of other commercial tobacco products, not for ceremonial use.

91. About how many American Indian adults in this community do you think smoke or use any commercial tobacco products? Would you say…

None ..... ☐
A few ..... ☐
Some ..... ☐
Most ..... ☐
All ..... ☐
DON'T KNOW/NOT SURE ..... ☐
REFUSED ..... ☐

92. How many of the people close to you, your family and close friends, smoke or use any commercial tobacco products? Would you say…

None ..... ☐
A few ..... ☐
Some ..... ☐
Most ..... ☐
All ..... ☐
DON'T KNOW/NOT SURE ..... ☐
REFUSED ..... ☐

93. About how many of the American Indian adults in this community, have quit smoking? Would you say…

None ..... ☐
A few ..... ☐
Some ..... ☐
Most ..... ☐
All ..... ☐
DON'T KNOW/NOT SURE ..... ☐
REFUSED ..... ☐

94. How many of the people close to you, your family and close friends, have quit smoking? Would you say…

None ..... ☐
A few ..... ☐
Some ..... ☐
Most ..... ☐
All ..... ☐
DON'T KNOW/NOT SURE ..... ☐
REFUSED ..... ☐

SECTION 8: SOCIAL INFLUENCES CONTINUED…

95. If you or someone you know were trying to quit smoking do you know of a program to help you or someone else quit?

Yes ..... ☐
No ..... ☐ **IF NO, SKIP TO Q97**
DON'T KNOW/NOT SURE ..... ☐
REFUSED ..... ☐

96. Do you know of a quit smoking program offered by any of the following…

	Yes	No	DK	REF
a. Quit Plan® (Clearway Minnesota).....	☐	☐	☐	☐
b. Insurance or Health Plan.....	☐	☐	☐	☐
c. Clinic.....	☐	☐	☐	☐
d. Workplace.....	☐	☐	☐	☐
e. Other.....	☐	☐	☐	☐

IF OTHER: Offered by? _____

SECTION 9: RISK PERCEPTION

Next I'd like to ask your opinion about some tobacco and health related issues.

97. Do you believe there is any harm in smoking an occasional cigarette?

Yes ..... ☐
No ..... ☐
DON'T KNOW/NOT SURE..... ☐
REFUSED ..... ☐

98. In your opinion, are any of the following products less harmful, more harmful or just as harmful as smoking regular cigarettes?

	Less	More	Same	DK	REF
a. Smokeless tobacco?	☐	☐	☐	☐	☐
b. Light cigarettes?	☐	☐	☐	☐	☐
c. Menthol cigarettes?	☐	☐	☐	☐	☐
d. Natural cigarettes (no additives)?	☐	☐	☐	☐	☐
e. Roll your own cigarettes?	☐	☐	☐	☐	☐

99. Do you think that breathing smoke from other people's cigarettes is…

Very harmful to one's health ..... ☐
Somewhat harmful..... ☐
Not very harmful ..... ☐
Not harmful at all to one's health ☐
DON'T KNOW/NOT SURE..... ☐
REFUSED ..... ☐

SECTION 9: RISK PERCEPTION CONTINUED…

100. Would you say that breathing smoke from other people's cigarette causes…

	Yes	No	DK	REF
a. Lung cancer in adults?	☐	☐	☐	☐
b. Other kinds of cancer in adults?	☐	☐	☐	☐
c. Heart disease in adults?	☐	☐	☐	☐
d. Respiratory problems in children?	☐	☐	☐	☐
e. Sudden infant death syndrome or SIDS?.....	☐	☐	☐	☐

SECTION 10: PERSONAL HEALTH

101. Have you ever been told by a doctor, nurse, or other health professional that you had asthma?

Yes ..... ☐
No ..... ☐ **IF NO SKIP TO Q103**
DON'T KNOW/NOT SURE..... ☐
REFUSED ..... ☐

102. Do you still have asthma?

Yes ..... ☐
No ..... ☐
DON'T KNOW/NOT SURE..... ☐
REFUSED ..... ☐

SECTION 10: PERSONAL HEALTH CONTINUED…

103. Now I am going to ask you about certain medical conditions. Have you **ever** been told by a doctor or other health professional that you had…

	Yes	No	DK	REF
a. Diabetes?	☐	☐	☐	☐
b. Heart attack?	☐	☐	☐	☐
c. Heart condition (other than heart attack)?	☐	☐	☐	☐
d. Hypertension, also called high blood pressure?	☐	☐	☐	☐
e. A stroke?	☐	☐	☐	☐
f. Emphysema, also called COPD?	☐	☐	☐	☐
g. Gum disease?	☐	☐	☐	☐
h. Lung cancer?	☐	☐	☐	☐
i. Other cancers or malignant tumors?	☐	☐	☐	☐
j. Pre-cancerous conditions?	☐	☐	☐	☐

104. **[FEMALE ONLY]** Are you currently pregnant?

Yes ..... ☐
No ..... ☐
DON'T KNOW/NOT SURE ..... ☐
REFUSED ..... ☐

105. How tall are you? ..... l____l FEET l____l____l INCHES
[ENTER BLOCK NUMBERS; ROUND TO CLOSEST WHOLE NUMBER]
DON'T KNOW/NOT SURE ..... ☐
REFUSED ..... ☐

106. About how much do you weigh? ..... l____l____l____l POUNDS
[ENTER BLOCK NUMBERS; ROUND TO CLOSEST WHOLE NUMBER]
DON'T KNOW/NOT SURE ..... ☐
REFUSED ..... ☐

SECTION 10.1: PHYSICAL ACTIVITY & DIET

107. In thinking about your activities at work, at home, & anywhere else, during the **past 7 days**, how many days did you get **at least 30 minutes of**…

a. moderate physical activity or exercise (light sweating and small increase in breathing or heart rate)? [THIS WOULD INCLUDE WALKING AND CLEANING]

Zero days ..... ☐
1 to 2 days ..... ☐
3 to 4 days ..... ☐
5 to 7 days ..... ☐
DON'T KNOW/NOT SURE..... ☐
REFUSED..... ☐

b. vigorous physical activity or exercise (heavy sweating and large increase in breathing or heart rate)? [THIS WOULD INCLUDE RUNNING AND FAST DANCING]

Zero days ..... ☐
1 to 2 days ..... ☐
3 to 4 days ..... ☐
5 to 7 days ..... ☐
DON'T KNOW/NOT SURE..... ☐
REFUSED..... ☐

108. Not including French fries, a **serving of vegetables** is a cup of salad greens, or a half-cup of any vegetables. **Yesterday**, how many servings of vegetables did you eat?

Zero servings..... ☐
1 serving ..... ☐
2 servings..... ☐
3 or more servings..... ☐
DON'T KNOW/NOT SURE..... ☐
REFUSED..... ☐

109. **A serving of fruit** is one medium-sized piece of fruit, ½ cup of chopped, cut, or canned fruit, or 6-ounces of 100% fruit juice. **Yesterday**, how many servings of fruit did you eat?

Zero servings..... ☐
1 serving ..... ☐
2 servings..... ☐
3 or more servings..... ☐
DON'T KNOW/NOT SURE..... ☐
REFUSED..... ☐

SECTION 11: HEALTH CARE COVERAGE & ACCESS

Now I am going to ask you about health care coverage and your use of health care.

110. Are you currently covered by any kind of health insurance or some other kind of health care plan?

Yes ..... ☐
No ..... ☐
DON'T KNOW/NOT SURE ..... ☐
REFUSED ..... ☐

111. In the **past 12 months**, about how many months were you without health care coverage?

☐	☐	☐	☐	☐	☐	☐
0	1-2	3-4	5-6	7-8	9-11	All 12

DON'T KNOW/NOT SURE ..... ☐
REFUSED ..... ☐

112. Are you eligible to receive health care at a tribal health clinic or IHS clinic in your area?

Yes ..... ☐
No, I am not eligible ..... ☐
No, there is not a clinic in my area ..... ☐
DON'T KNOW/NOT SURE ..... ☐
REFUSED ..... ☐

113. Where do you **usually** go when you are sick or need advice about your health?

I don't go anywhere..... ☐
A tribal or IHS clinic on a reservation..... ☐ → Name of clinic:_____
A community clinic ..... ☐ ↗ _____
A hospital emergency room..... ☐
Somewhere else..... ☐ Where?_____
DON'T KNOW/NOT SURE..... ☐ _____
REFUSED..... ☐

114. Do you have at least one person you think of as your personal doctor or health care provider?

Yes ..... ☐
No ..... ☐
DON'T KNOW/NOT SURE ..... ☐
REFUSED ..... ☐

SECTION 12: DEMOGRAPHICS

115. What is your age? **[DO NOT READ CATEGORIES]**

18 TO 24 YRS ..... ☐
25 TO 29 YRS ..... ☐
30 TO 34 YRS ..... ☐
35 TO 44 YRS ..... ☐
45 TO 54 YRS ..... ☐
55 TO 64 YRS ..... ☐
65+ YRS ..... ☐
DON'T KNOW/NOT SURE ..... ☐
REFUSED ..... ☐

116. CHECK BOX APPROPRIATE FOR PARTICIPANT **[DO NOT READ CATEGORIES]**

MALE ..... ☐
FEMALE..... ☐
DON'T KNOW/NOT SURE..... ☐
REFUSED..... ☐

117. Not including yourself, how many people live in your household?

☐	☐	☐	☐	☐	☐	☐	☐	**[IF 0, SKIP TO Q122]**
0	1	2	3	4	5	6	7+	

DON'T KNOW/NOT SURE..... ☐
REFUSED ..... ☐

118. How **many children aged 17 or younger** live in your household?

☐	☐	☐	☐	☐	☐	☐	**[IF 0, SKIP TO Q120]**
0	1	2	3	4	5	6+	

DON'T KNOW/NOT SURE..... ☐
REFUSED..... ☐

119. Are any of the children in your household…

	Yes	No	DK	REF
a. Younger than 1 year?	☐	☐	☐	☐
b. Between 1 year and 5 years?.....	☐	☐	☐	☐
c. Between 6 years and 8 years?	☐	☐	☐	☐
d. Between 9 years and 12 years?	☐	☐	☐	☐
e. Between 13 years and 17 years?	☐	☐	☐	☐

SECTION 12: DEMOGRAPHICS CONTINUED…

120. Do you live with a spouse, partner, or significant other?

Yes ..... ☐
No ..... ☐
DON'T KNOW/NOT SURE..... ☐
REFUSED ..... ☐

121. Not including ceremonial or sacred use, and not including yourself, how many of the people who live in your household smoke cigarettes, cigars, or pipes? **# OF PEOPLE**

☐	☐	☐	☐	☐	☐	☐	☐
0	1	2	3	4	5	6	7+

DON'T KNOW/NOT SURE..... ☐
REFUSED ..... ☐

122. How would you describe your race/ethnicity? **[CHOOSE ALL THAT APPLY]**

American Indian, Alaska Native .. ☐
White ..... ☐
Black or African American ..... ☐
Hispanic or Latino ..... ☐
Asian ..... ☐
Pacific Islander, Native Hawaiian ☐
DON'T KNOW/NOT SURE..... ☐
REFUSED ..... ☐

123. Are you enrolled in a tribe?

Yes ..... ☐ Which one? _____
No ..... ☐
DON'T KNOW/NOT SURE..... ☐
REFUSED ..... ☐

124. Are there any other tribes that you feel a part of, but are not enrolled in?

Yes ..... ☐ Which one? _____
No ..... ☐
DON'T KNOW/NOT SURE..... ☐
REFUSED ..... ☐

125. Do you live on a reservation?

Yes ..... ☐
No ..... ☐
DON'T KNOW/NOT SURE..... ☐
REFUSED ..... ☐

SECTION 12: DEMOGRAPHICS CONTINUED…

126. What is the zip code where you currently live?

|____|____|____|____|____| [ENTER BLOCK NUMBERS FOR 5-DIGIT ZIP CODE]

DON'T KNOW/NOT SURE..... ☐
REFUSED..... ☐

127. In the **past 5 years**, have you moved to a different zip code for **at least 1 month**?

Yes..... ☐
No..... ☐
DON'T KNOW/NOT SURE..... ☐
REFUSED..... ☐

128. What is the highest level of school you completed or the highest degree you received? Please stop me when I get to your answer.

Never attended high school..... ☐
Some high school..... ☐
High school graduate..... ☐
GED..... ☐
Some college, no degree..... ☐
Completed a technical or certificate program ..... ☐
Two-year degree ..... ☐
Four-year degree..... ..... ☐
Some graduate or professional school ..... ☐
Graduate or professional degree ..... ☐
DON'T KNOW/NOT SURE..... ☐
REFUSED..... ☐

129. In the past 12 months, what was your total household income?
INCLUDE INCOME EARNINGS FROM ALL SOURCES

Less than $10,000 ..... ☐
$10,000-$20,000..... ☐
$21,000-$30,000..... ☐
$31,000-$40,000..... ☐
$41,000-$50,000..... ☐
$51,000+ ..... ☐
DON'T KNOW/NOT SURE..... ☐
REFUSED..... ☐

Thank you! Miigwetch! Wopida!

|___|___| : |___|___| ☐ am ☐ pm

INTERVIEW END TIME